STATE COLLEGE RECORD

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The North Carolina State College

of

Agriculture and Engineering

of

THE UNIVERSITY OF NORTH CAROLINA

CATALOG ISSUE

1947-48

Announcements for the Session 1948-1949

STATE COLLEGE STATION
RALEIGH

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COLLEGE CALENDAR
1948-49

	1948 Fall	1949 Winter	1949 Spring	1949 Summer
College faculty meeting, Wednesday, 3 P. M....	Sept. 15			
[1+2] Registration of freshmen	Sept. 17	Jan. 3-4	Mch. 25-26	June 16
[1+4] Registration of sophomores, juniors, seniors and graduate students	Sept. 20-22	Jan. 3-4	Mch. 25-26	June 16
[1+3] Registration of new students admitted with advanced standing	Sept. 20	Jan. 3-4	Mch. 25-26	June 16
Classwork begins	Sept. 23	Jan. 5	Mch. 28	June 17
Anniversary Day (not a holiday)	Oct. 3			
Last day for registration, for changes in registration, or for dropping a course without a grade of F.	Oct. 2	Jan. 11	Apl. 2	June 22
Midterm reports due	Nov. 1	Feb. 7		
Thanksgiving holiday	Nov. 25-27			
Scholarship Day (not a holiday)			May 11	
Final examinations begin	Dec. 10	Mch. 11	June 4	
Term ends	Dec. 16	Mch. 19	June 10	July 29
Commencement exercises			June 12-13	

[1] An extra fee is charged for registration after the day designated.
[2] Freshmen should be present for the first Assembly in pullen Hall at 7:15 P. M .Sept. 16.
[3] New students with advanced standing of fewer than 45 credits register with the freshmen. See footnote 2.
[4] Each student should register at time to be designated.

1948

JANUARY

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B.S. in M.E., B.S. in Ind. Educ., M.Ed., Pennsylvania State College.

WILLIAM CHARLES CORRELL, *Instructor in Architecture.*
B.S., N. C. State College.

ESTER LEE COX, *Instructor in English.*
A.B., Guilford College; M.A., Duke University.

GERTRUDE MARY COX, *Head, Department of Experimental Statistics; Director, Institute of Statistics.*
B.S., M.S., Iowa State College.

WILLIAM K. CRAMER, *Instructor in Military Science and Tactics.*
Technician Fifth Grade, Infantry, U. S. Army.

ALEXANDER CRANE, *Assistant Professor of Architecture.*

CLYDE ROBER CRAVEN, *Instructor in English.*
A.B., M.A., Duke University.

MRS. PHOEBE F. CRAVEN, *Instructor in English.*
B.A., Duke University; M.A., Boston University.

GEORGE WILLIAM CRAWFORD, *Instructor in Physics.*
B.S., Davidson College.

JANIE PEARL CRUMPTON, *Instructor in Mathematics.*
A.B., Woman's College, U. N. C.

RALPH WALDO CUMMINGS, *Professor of Agronomy; Associate Director, Agricultural Experiment Station.*
B.S., N. C. State College; Ph.D., Ohio State University.

DAVID OSCAR DANIEL, JR., *Instructor in Chemistry.*
B.S., University of South Carolina.

ARTEMAS KEITT DARBY, JR., *Instructor in Physics.*
B.S., Presbyterian College.

PHILIP HARVEY DAVIS, *Assistant Professor of English.*
A.B., A.M., Miami University.

ROY STYRING DEARSTYNE, *Professor of Poultry Science.*
B.S., University of Maryland; M.S., N. C. State College.

JAMES EDWARD DEAS, *Research Assistant in Engineering Research.*
B.Ch.E., North Carolina State College.

EUGENE ALLEN DEES, *Assistant Professor of Military Science and Tactics.*
Lieutenant Colonel, Infantry, U. S. Army; B.S., N. C. State College; Graduate, Command and General Staff School.

ERIC BROOKS DEGROAT, *Instructor in Physical Education.*
B.S., Springfield College of Physical Education.

JESUS DE LA RAMA, *Research Technologist in Textiles.*
B.S., N. C. State College.

*JOHN BEWLEY DERIEUX, *Professor Emeritus of Physics.*
B.S., M.S., University of Tennessee; Ph.D., University of Chicago.

MRS. LUCILE LAWTON DICKINSON, *Instructor in English.*
A.B., Florida State College: M.A., Duke University.

MERIWETHER BLAIR DICKINSON, *Instructor in English.*
A.B. Hampden-Sydney College: A.M., University of Virginia.

CHARLES GLENN DOAK, *Assistant Professor of Physical Education.*

HENRY A. DOAK, *Lecturer in English.*
A.B., Guilford College; A.B., Haverford College; A.M., Harvard University.

MRS. MARY ELLICE DOAK, *Instructor in English.*
A.B., University of Missouri.

JESSE SEYMOUR DOOLITTLE, *Professor of Mechanical Engineering.*
B.S., Tufts College; M. S., Pennsylvania State College.

*** Deceased.**

WILLIAM CHARLES DRANE, *Instructor in Physics.*
B.S., M.S., Boston College.

RICHARD HIGGS DUNCAN, *Instructor in Mechanical Engineering.*
B.M.E., N. C. State College.

GEORGE HEYWARD DUNLAP, *Technologist in Textiles.*
B.S., Clemson College.

PRESTON WILLIAM EDSALL, *Professor of History and Political Science.*
B.S., New York University; A.M., Ph.D., Princeton University.

JOHN LEE EDWARDS, JR., *Assistant Professor of Air Science and Tactics.*
Captain, Air Corps-Reserve, AUS; A.B., Elon College; Graduate, Army Air Force Cadet Flying School.

MISS STELLA EFLAND, *Research Assistant in Dairy Manufacturing.*
A.B., Woman's College, U. N. C.

KENNETH EICHELBERGER, *Instructor in Military Science and Tactics.*
Technical Sergeant, Corps of Military Police, U. S. Army.

FRED IRVINE ELLIOTT, *Associate Professor of Dairy Husbandry.*
B.S.A., Ohio State University; M.S., Ph.D., Cornell University.

DON EDWIN ELLIS, *Research Associate Professor of Plant Pathology.*
B.Sc., B.A., Central College; M.S., Louisiana State University; Ph.D.. University of North Carolina.

LAWRENCE ALBERT ENERSEN, *Professor of Landscape Architecture.*
A.B., Carlton College; M.L.A., Charles Eliot Traveling Fellow in Landscape Architecture, Harvard University.

JAMES JOHN ENGLAND, *Professor of Air Science and Tactics.*
Major, Air Corps-Reserve, AUS; B.A., Lambuth College; Graduate Army Air Force Cadet Flying School; Graduate, Army Air Force Instructor's School.

MARVIN LEE ENGLISH, *Instructor in Mechanical Engineering.*
B.S., North Dakota State College; M.S., University of Minnesota.

MRS. ANNE BYRD ENGMAN, *Instructor in English.*
B.S., Western Carolina Teachers' College.

WEEMS EDWARD ESTELLE, *Instructor in Electrical Engineering.*
B.S., Massachusetts Institute of Technology.

JOHN LAWRENCE EVERS, *Associate Professor of Zoology.*
B.A., Ph.D., University of Texas.

WILLIAM R. FALLS, *Instructor of Military Science and Tactics.*
Sergeant, U. S. Army.

CHARLES EDWARD FELTNER, *Associate Professor of Engineering Mechanics.*
B.S. in C.E., Virginia Polytechnic Institute; S.M.C.E., University of North Carolina.

EUGENE BROOKS FINCH, *Instructor in Chemical Engineering.*
B.Ch.E., N. C. State College.

HILBERT ADAM FISHER, *Professor of Mathematics.*
M.S., N. C. State College; Graduate, United States Naval Academy; Graduate, United States Submarine School; LL.D., Lenoir Rhyne College.

GARNET WOLSEY FORSTER, *Professor of Agricultural Economics.*
B.S., Cornell University; M.S., Ph.D., University of Wisconsin.

ROBERT MORRIS FOSTER, *Research Assistant in Engineering Research.*
B.S. in M.E., North Carolina State College.

ALVIN MARCUS FOUNTAIN, *Professor of English.*
B.E., M.S., N. C. State College; M.A., Columbia University; Ph.D., Peabody College.

RAYMOND SPIVEY FOURAKER, *Professor of Electrical Engineering.*
B.S., A.&M. College of Texas; M.S., University of Texas.

WILLIAM BASIL FOX, *Assistant Professor of Botany.*
B.Sc. in Ed., M.Sc., West Virginia University; Ph.D., State University of Iowa.

JAMES GIDEON FRANCIS, *Assistant Professor of Horticulture.*
B.S., N. C. State College; M.S., Cornell University.

RUDOLF ERNST FREUND, *Associate Professor of Economics.*
Abiturium. Karlsruhe, Germany; Ph.D., Heidelberg.

BENTLEY BALL FULTON, *Professor of Entomology.*
B.A., Ohio State University; M.S., Chicago University; Ph.D., Iowa State College.

FRANCIS FREEMAN FUNK, *Instructor in Civil Engineering.*
B.S. in C.E., Virginia Polytechnic Institute.

HENRY BEVERLEY GARDEN, *Head Department of Synthetic Fibers, School of Textiles.*
B.S., Georgia School of Technology.

MONROE EVANS GARDNER, *Professor of Horticulture.*
B.S., Virginia Polytechnic Institute.

MRS. MARTHA JOHNSON GARREN, *Instructor in Mathematics.*
A.B., University of North Carolina.

SAMUEL ALEX GIBSON, *Professor of Military Science and Tactics.*
Colonel, Infantry, U. S. Army; B.S., United States Military Academy; Graduate, Advanced Officers' Course, The Infantry School; Honor Graduate, Command and General Staff School; Graduate, Army War College.

GEORGE WALLACE GILES, *Professor of Agricultural Engineering.*
B.S., University of Nebraska; M.S., University of Missouri.

HARVEY FRANK GIRVIN, *Visiting Professor of Engineering Mechanics.*
B.M.E., University of Michigan.

EDWARD WALKER GLAZNER, *Associate Professor of Poultry Science.*
B.S., N. C. State College; M.S., University of Maryland.

KARL BROWNING GLENN, *Associate Professor of Electrical Engineering.*
B.E., M.S., N. C. State College.

ROBERT KENNETH GODFREY, *Assistant Professor of Botany.*
A.B., Maryville College; M.S., N. C. State College; M.A., Harvard University.

LEMUEL GOODE, *Instructor in Animal Industry.*
B.S., M.S., West Virginia University.

JAMES HENRY GRADY, *Associate Professor of Architecture.*
B.Arch., Ohio State University; Registered Architect.

WILLIAM JOHNSON GRAVES, *Instructor in Mathematics.*
A.B., University of North Carolina.

MRS. RUTH MARCK GREENBERG, *Instructor of Chemistry.*
B.S., University of Minnesota; M.S., Yale University.

ROBERT EDWARD LEE GREENE, *Associate Professor of Agricultural Economics.*
B.S., M.S., North Carolina State College; Ph.D., Cornell University.

MRS. DOROTHY P. GREENWOOD, *Instructor in English.*
A.B., Randolph-Macon Woman's College; M.A., Tulane University of Louisiana.

WALTON CARLYLE GREGORY, *Associate Professor of Agronomy.*
B.A., Lynchburg College; M.A., Ph.D., University of Virginia.

MISS HAZEL CORNELIA GRIFFIN, *Instructor in English.*
A.B., Chowan College; M.S., N. C. State College.

ALBERT HARVEY GRIMSHAW, *Professor of Textile Chemistry and Dyeing.*
Graduate of the New Bedford Textile Institute; B.S., M.S., N. C. State College.

CLAUDE DELBERT GRINNELLS, *Professor of Veterinary Science.*
B.S., M.S., University of Minnesota; D.V.M., Cornell University.

ALAN DOUGLAS GRINSTED, *Professor of Psychology.*
B.A., Buchnell University; M.A., University of Florida; Ph.D., Louisana State University.

HENRY EDWIN GRISET, *Associate Professor of Civil Engineering.*
B.S. in C.E., New York University; M.C.E., Polytechnic Institute of Brooklyn.

DANIEL SWARTWOOD GROSCH, *Assistant Professor of Zoology.*
B.S., Moravian College; M.S., Lehigh University; Ph.D., University of Pennsylvania.

ELLIOT BROWN GROVER, *Head, Department of Yarn Manufacturing, School of Textiles.*
B.S., Massachusetts Institute of Technology.

GEORGE ALBERT GULLETTE, *Professor of Social Studies.*
A.B., Harvard College; M.A., Vanderbilt University; Ph.D., University of Michigan.

ALBERT G. GUY, *Associate Professor of Mechanical Engineering.*
S.B., University of Chicago; M.S., Ohio State University; D.Sc., Carnegie Institute of Technology.

WILLIAM CULLEN HACKLER, *Instructor in Ceramic Engineering.*
B.S., M.S., Virginia Polytechnic Institute.

FREDERICK MORGAN HAIG, *Professor of Dairy Husbandry.*
B.S., University of Maryland; M.S., N. C. State College.

MRS. RUTH BADGER HALL, *Assistant Professor of Modern Languages.*
A.B., Oberlin College; M.A., University of North Carolina.

CHARLES HORACE HAMILTON, *Professor of Rural Sociology.*
B.A., Southern Methodist University; M.S., Texas A. & M. College; Ph.D., University of North Carolina.

KARL P. HANSON, *Professor of Mechanical Engineering.*
B.S., University of Wisconsin; M.S., University of Michigan.

REINARD HARKEMA, *Professor of Zoology.*
A.B., Calvin College; Ph.D., Duke University.

PAUL C. HARMON, *Instructor in Military Science and Tactics.*
Master Sergeant, Coast Artillery, U. S. Army.

MRS. SADIE JENKINS HARMON, *Visiting Professor of English.*
A.B., B.Mus., Greensboro College; M.A., Ph.D., University of North Carolina.

MRS. ANNA MAE HARRIS, *Instructor in Mathematics.*
B.S., Mary Washington College; M.A., University of Virginia.

MRS. MINNIE WILFORD CALDWELL HARRIS, *Instructor in Physics.*
A.B., B.S., M.A., University of Missouri.

THOMAS PERRIN HARRISON, *Dean Emeritus of the College; Editor of Official College Publications.*
B.S., Citadel; Ph.D., Johns Hopkins University; LL.D., Citadel..

CARL D. HART, *Visiting Professor of Industrial Engineering.*
M.E., Cornell University.

THOMAS ROY HART, *Head, Department of Weaving and Designing, School of Textiles.*
B.S., T.E., M.S., N. C. State College.

LODWICK CHARLES HARTLEY, *Professor of English.*
B.A., Furman University; M.A., Columbia University; Ph.D., Princeton University.

V. A. HARVILL, *Instructor in Engineering Mechanics.*
B.S. in M.E., Texas A. &M. College.

ARTHUR COURTNEY HAYES, *Associate Professor of Textile Chemistry and Dyeing.*
Ph.B., Brown University; M.S., N. C. State College.

WILLIAM CLIFTON HAYES, JR., *Instructor in Geology.*
B.S., Drury College; M.S., Missouri School of Mines and Metallurgy.

CHARLES MCGEE HECK, *Professor Emeritus of Physics.*
A.B., Wake Forest College; M.A., Columbia University.

RUFUS MARSHALL HELMS, *Instructor in Physics.*
A.B., Duke University; M.S., Columbia University.

WILLIAM NORWOOD HICKS, *Professor of Ethics and Religion.*
B.E,. M.S., N. C. State College; A.B., Duke University; M.A., Oberlin College.

JAMES HAROLD HILTON, *Professor of Animal Industry; Dean of Agriculture; Director, Agricultural Experiment Station.*
B.S.A., Iowa State College; M.S., University of Wisconsin; D.Sc., Purdue University.

JOHN THOMAS HILTON, *Professor of Textiles.*
Diploma, Bradford Durfee Textile School; B.S., M.S., N. C. State College.

THOMAS IRA HINES, *Associate Professor of Industrial and Rural Recreation.*
B.S., N. C. State College; M.A., University of North Carolina.

LAWRENCE EARLE HINKLE, *Professor of Modern Languages.*
B.A., University of Colorado; M.A., Columbia University; D.S.es L., Dijon University.

ELMER GEORGE HOEFER, *Professor of Mechanical Engineering.*
B.S., M.E., University of Wisconsin.

ADOLF HOERMANN, *Special Lecturer in Diesel Engineering.*
M.S., Institute of Technology, Munich.

JULIUS VALENTINE HOFMANN, *Director of the Division of Forestry.*
B.S.F., M.F., Ph.D., University of Minnesota.

JOHN STEPHEN HOLLOWAY, *Instructor in Architecture.*
B.S., N. C. State College.

EDWARD LEE HOLT, *Instructor in Geology.*
B.S., Coe College; M.S., University of Colorado.

MRS. RUTH BALL HONEYCUTT, *Instructor in Mathematics.*
B.S., Wellesley College; M.A., Duke University.

MRS. BEATRICE ROBERTS HOSLEY, *Instructor in Mathematics.*
A.B., Woman's College; U. N. C.; M.A., Duke University.

EARL HENRY HOSTETLER, *Professor of Animal Husbandry.*
B.S. in Agriculture, Kansas State Agricultural College; M.Agr., M.S., N. C. State College.

EZRA LEWIS HOWELL, *Instructor of Agricultural Engineering.*
B.S., N. C. State College.

MRS. SUE CRAFT HOWELL, *Instructor in English.*
A.B., Guilford College; M.S., N. C. State College.

ALBRECHT W. HUSSMANN, *Special Lecturer in Diesel Engineering.*
M.S., Institute of Technology, Berlin; Ph.D., Institute of Technology, Berlin.

THOMAS EDWARD HYDE, *Instructor in Mechanical Engineering.*

WILLIAM P. INGRAM, JR., *Instructor in Chemistry.*
B.S., N. C. State College.

MARTHA ESTELLE IVEY, *Instructor in Mathematics.*
A.B., Woman's College, U. N. C.

HERMAN BROOKS JAMES, *Professor of Agricultural Economics.*
B.S., M.S., N. C. State College.

CARLTON CECIL JENKINS, *Instructor in Social Studies.*
A.B., College of William and Mary; M.A., Teachers College, Columbia University.

JAMES HERBERT JENSON, *Professor of Plant Pathology.*
B.S., A.M., University of Nebraska; Ph.D., University of Wisconsin.

CLARKSTON EDWARDS JOHNSON, *Assistant Professor of Textiles.*
B.S., N. C. State College.

JEFFERSON HORACE JOHNSON, *Instructor in Engineering Mechanics.*
B.S., University of Virginia.

JOSEPH CLYDE JOHNSON, *Assistant Professor of Psychology.*
B.S., State Teachers College, (Troy, Alabama); M.A., George Peabody College for Teachers.

THEODORE SEDGWICK, JOHNSON, *Assistant Administrator.*
B.S., M.S., Denison University; C.E., Ohio University.

IVAN DUNLAVY JONES, *Professor of Horticulture.*
A.B., Nebraska Wesleyan University; Ph.D., University of Minnesota.

WALTER EDWARD JORDAN, *Associate Professor of Chemistry.*
B.S., M.A., Wake Forest College; M.S., N. C. State College.

LEO MARTIN KANE, *Assistant Professor of Military Science and Tactics.*
Major, U. S. Army; B. S., Indiana University.

CLEMENS M. KAUFMAN, *Associate Professor of Forestry.*
A.B., Bethel College; M.S., Ph.D., University of Minnesota.

JAMES ANDERSON KELLEY, *Instructor in Mathematics.*
B.S., Clemson College.

JOSEPH WHEELER KELLY, *Associate Professor of Poultry Science.*
B.S., M.S., N. C. State College; Ph.D., Iowa State College.

MRS. MARTHA WALLACE KERR, *Research Technologist in Textiles.*
B.S., N. C. State College.

THOMAS KERR, *Professor of Agronomy.*
A.B., M.S., Ph.D., University of Pennsylvania.

*HENDERSON GRADY KINCHELOE, *Assistant Professor of English.*
A.B., University of Richmond; A.M., Harvard University; Ph.D., Duke University.

HENRY LEWIS KINGSBURY, JR., *Instructor in Civil Engineering.*
B.C.E., Catholic University of America.

JOHN ALNUTT TALBOT KINGSBURY, *Instructor in Social Studies.*
A.B., Central College; D.B., University of Chicago.

WILLIAM HARRISON KITE, JR., *Instructor in Diesel Engineering.*
B.S., University of Virginia.

GLENN CHARLES KLINGMAN, *Associate Professor of Argonomy.*
B.S., University of Nebraska; M.S., Kansas State College.

CHARLES FREDERICK KOLB, *Instructor in History and Political Science.*
A.B., Drury College; A.M., University of Kentucky.

WILLIAM WURTH KRIEGEL, *Professor of Ceramic Engineering.*
B.S. in Civil Engineering and B.S. in Ceramic Engineering, University of Washington; M.S., Montana School of Mines; Dr. Ing., Technische Hochschule, Hannover, Germany.

WALTER MICHAEL KULASH, *Associate Professor of Zoology.*
B.S., M.S., Ph.D., Massachusetts State College.

ARTHUR IRISH LADU, *Professor of English.*
A.B., Syracuse University; M.A., Ph.D., University of North Carolina.

CLAUDE MILTON LAMBE, *Assistant Professor of Civil Engineering.*
B.S., N. C. State College.

JOHN HAROLD LAMPE, *Dean of the School of Engineering.*
B.S., M.S., Dr. Eng., John Hopkins University.

FORREST WESLEY LANCASTER, *Associate Professor of Physics.*
B.S. in Ch.E., Purdue University.

LAURENCE CLARK LARKIN, JR., *Instructor of Economics.*
B.S., Business Admin., Rhode Island State College.

VIRGIL TRUITT LARKIN, *Instructor in Air Science and Tactics.*
Technical Sergeant, Air Corps, U. S. Army.

ROBERTS C. LASATER, *Assistant Professor of Religion.*
A.B., Wake Forest College; B.D., Southern Baptist Theological Seminary.

MARC CARL LEAGER, *Professor of Statistics and Accounting.*
B.S., M.S., University of Minnesota; Ph.D., Columbia University.

JOHN EMERY LEAR, *Professor of Electrical Engineering.*
B.S., Virginia Polytechnic Institute; E.E., Texas A. & M. College.

THOMAS BENSON LEDBETTER, *Instructor in Mechanical Engineering.*
B.M.E., N. C. State College.

WILLIAM DANIEL LEE, *Associate Professor of Agronomy.*
B.S., N. C. State College.

SAMUEL GEORGE LEHMAN, *Professor of Plant Pathology.*
B.S., Ohio University; M.S., N. C. State College; Ph.D., Washington University.

HENRY PETERSON LEIGHTON, *Instructor in Military Science and Tactics.*
Master Sergeant, Adjutant General's Department, U. S. Army.

MRS. NORA BINDER LEITCH, *Instructor in English.*
A.B., Meredith College.

PAUL BONAR LEONARD, *Assistant Professor of Mechanical Engineering.*
B.S., Ohio State University; M.A., University of North Carolina.

* On leave 1947-48

JACK LEVINE, *Professor of Mathematics.*
A.B., University of California; Ph.D., Princeton University.

CHARLES FREDERICK LEWIS, *Instructor in Mathematics.*
B.S., Tennessee State College; M.A., Peabody College.

EDWARD HASKELL LEWIS, *Instructor in Mechanical Engineering.*
B.S., N. C. State College; M.A., University of Minnesota.

JOHN GARY LEWIS, *Associate Professor of Textiles.*
B.S., M.S., N. C. State College.

PAUL E. LEWIS, *Assistant Professor of Mathematics.*
B.S., Northeastern Oklahoma College; M.S., Oklahoma A. & M.; Ph.D., University of Illinois.

JAMES OUSBY LITCHFORD, *Instructor in Civil Engineering.*
B.S. in C.E., N. C. State College.

CHARLES HOWIE LITTLE, JR., *Assistant Professor of Mathematics.*
A.B., Davidson College; M.A., University of North Carolina.

MRS. CHARLOTTE ZIMMERMAN LITWACK, *Instructor in English.*
A.B., Bryn Mawr College.

ROBERT WARREN LLEWELLYN, *Instructor in Industrial Engineering.*
B.S. in E.E., Union College; M.S. in I.E., Purdue University.

RICHARD HENRY LOEPPERT, *Associate Professor of Chemistry.*
B.S., Northwestern University; Ph.D., University of Minnesota.

LEONARD WOOD LONG, *Instructor in Engineering Mechanics.*
B.E.E., N. C. State College.

WILLIAM FRANCIS EDWARD LONG, II, *Instructor of Economics.*
A.B., A.M., George Washington University.

ROBERT HUDSON LONGSTREET, *Instructor in Architecture.*
Registered Architect.

ROY LEE LOVVORN, *Professor of Agronomy.*
B.S., Alabama Polytechnic Institute; M.S., University of Missouri; Ph.D., University of Wisconsin.

HENRY LAWRENCE LUCAS, JR., *Associate Professor, Institute of Statistics.*
B.S., University of California; Ph.D., Cornell University.

JOHN ROBERT LUDINGTON, *Professor of Industrial Arts Education.*
B.S., Ball State Teachers College; M.A., Ph.D., Ohio State University.

JAMES FULTON LUTZ, *Professor of Agronomy.*
B.S., N. C. State College; M.A., Ph.D., University of Missouri.

JOSEPH THOMAS LYNN, *Assistant Professor of Physics.*
A.B., Vanderbilt University; M.S., Ohio State University.

JAMES A. LYONS, *Associate Professor of Economics.*
B.S., Cornell University; LL.B., Vanderbilt University; M.A., Ph.D., University of Iowa.

CLAYTON DOYLE MCAULIFFE, *Research Assistant Professor of Agronomy.*
A.B., Nebraska Wesleyan University; M.S., University of Minnesota.

JAMES W. MCDANIEL, *Instructor in Military Science and Tactics.*
Staff Sergeant, Ordnance, U. S. Army.

PATRICK HILL MCDONALD, JR., *Instructor in Mechanical Engineering.*
B.M.E., N. C. State College.

ALAN BRIDGEMAN MACINTYRE, *Instructor in Electrical Engineering.*
B.S.E.E., N. C. State College.

ARTHUR MCKIMMON, II, *Instructor in Architecture.*
B.S., N. C. State College; Registered Architect.

DAVID EUGENE MCQUISTON, *Instructor in Air Science and Tactics.*
Master Sergeant, Air Corps, U. S. Army.

FRANCIS EDWARD MCVAY, *Assistant Professor of Economics.*
B.S., Rhode Island State College; M.S., North Carolina State College; Ph.D., University of North Carolina.

CHARLES WALKER MADDISON, *Foreman of Foundry.*

ARMSTRONG MALTBIE, *Instructor in Mathematics.*
B.S., University of Vermont.

CARROLL LAMB MANN, *Professor of Civil Engineering.*
B.S., C.E., N. C. State College.

LEONARD ROBERT MANN, *Instructor in Civil Engineering.*
B.S. in C.E., Virginia Polytechnic Institute.

EDWARD GEORGE MANNING, *Instructor in Electrical Engineering.*
B.S.E.E., Lehigh University.

JERRY W. MAREK, *Instructor in Chemistry.*
B.S., M.S., Texas A. & M. College.

ROGER POWELL MARSHALL, *Professor of English.*
A.B., Wake Forest College; M.A., Columbia University; M.S., N. C. State College.

THOMAS JACKSON MARTIN, JR., *Assistant Professor of Mechanical Engineering.*
B.E., M.S., N. C. State College.

DONALD ROSS MAY, JR., *Assistant Professor of Air Science and Tactics.*
Captain, Air Corps-Reserve, AUS; B.S., Clemson College; Graduate, Army Air Force Cadet Navigation Training School; Graduate, Army Air Force Engineering Officers' School; Graduate, Army Air Force Radar, Navigation and Bombing School.

JAMES B. MAY, *Instructor in Military Science and Tactics.*
Master Sergeant, Corps of Engineers, U. S. Army.

SELZ CABOT MAYO, *Associate Professor of Rural Sociology.*
A.B., Atlantic Christian College; M.S., N. C. State College; Ph.D. University of North Carolina.

JEFFERSON SULLIVAN MEARES, *Professor of Physics.*
B.S., University of South Carolina; M.S., N. C. State College.

ZENO PAYNE METCALF, *Professor of Zoology, Associate Dean of the Graduate School.*
B.A., Ohio State University; D.Sc., Harvard University.

GORDON KENNEDY MIDDLETON, *Professor of Agronomy.*
B.S., N. C. State College; M.S., Ph.D., Cornell University.

EDWIN LAWRENCE MILLER, JR., *Assistant Professor of Geology.*
B.S., E.M., Missouri School of Mines and Metallurgy; M.S., N. C. State College.

JOHN FLETCHER MILLER, *Professor of Physical Education.*
B.Pd., Central Missouri Teachers' College; B.P.E., Springfield College of Physical Education.

WILLIAM DYKSTRA MILLER, *Associate Professor of Forestry.*
B.A., Reed College; M.F., Ph.D., Yale University.

ADOLPHUS MITCHELL, *Associate Professor of Engineering Mechanics.*
B.S. in C.E., M.S. in C.E., University of North Carolina.

PAUL BLACKBURN MITCHELL, *Instructor in Physics.*
B.S., Morehead State Teachers College.

THEODORE BERTIS MITCHELL, *Professor of Zoology and Entomology.*
B.S., Massachusetts State College; M.S., N. C. State College; D.S., Harvard University.

REUBEN O. MOEN, *Professor of Business Administration.*
B.A., M.A., Ph.D., University of Iowa.

DANNIE JOSEPH MOFFIE, *Head of the Department of Psychology.*
B.S., M.S., Ph.D., Pennsylvania State College.

ROBERT JAMES MONROE, *Instructor in Experimental Statistics.*
B.S., Iowa State College.

PERRY EARL MOOSE, *Associate Professor of Mechanical Engineering.*
B.S., N. C. State College; M.S. in C.E., Purdue University.

JOHN WESLEY MORGAN, *Instructor in Chemistry.*
A.B., A.M., Duke University.

HARVEY LOUIE MORRISON, *Instructor in Physics.*
A.B., Davidson College.

EMMETT B. MORROW, *Associate Professor of Horticulture.*
B.S., N. C. State College; M.S., University of California.

JOHN KENNETH MORTON, *Instructor in Military Science and Tactics.*
Master Sergeant, Quartermaster Corps, U. S. Army.

WILLIAM EDWIN MOSER, *Associate Professor of Textiles.*
B.S., N. C. State College.

LOUIS CHARLES MOSSBAUER, *Instructor in Military Science and Tactics.*
Technical Sergeant, Infantry, U. S. Army.

CAREY GARDNER MUMFORD, *Professor of Mathematics.*
B.A., Wake Forest College; A.M., Ph.D., Duke University.

HOWARD M. NAHIKIAN, *Associate Professor of Mathematics.*
A.B., M.A., Ph.D., University of North Carolina.

THOMAS LEWIS NASH, *Instructor in Mechanical Engineering.*
B.S., United States Naval Academy.

WILLIAM MCCORMICK NEALE, JR., *Instructor in Mechanical Engineering.*
B.M.E., N. C. State College.

JOHN GORDON NELSON, *Assistant Professor of Military Science and Tactics.*
Lieutenant Colonel, Signal Corps, U. S. Army; A.B., University of Minnesota; Graduate Advanced Officers' Course and ESCS Course, Signal Corps School.

THOMAS NELSON, *Dean Emeritus of the School of Textiles.*
D.Sc., N. C. State College.

WERNER LIND NELSON, *Professor of Agronomy.*
B.S., M.S., University of Illinois; Ph.D., Ohio State University.

WILLIAM B. NESBIT, *Assistant Professor of Poultry.*
B.S., N. C. State College.

GRASON TEMPLETON NICKELL, *Instructor in Mechanical Engineering.*
B.M.E., University of Virginia.

STUART MCGUIRE NOBLIN, *Assistant Professor of History and Political Science.*
A.B., Davidson College; A.M., Ph.D., University of North Carolina.

ARNOLD NOLSTAD, *Assistant Professor of Mathematics.*
B.A., Luther College; M.A., University of Pittsburg.

FELIX ALEXANDER NYLUND, *Associate Professor of Agricultural Education.*
B.S., M.S., University of Minnesota; Ph.D., Cornell University.

DANIEL F. O'DONNELL, *Instructor in Diesel Engineering.*
B.S., Buffalo, State Teachers College.

HARVEY BURNELL OHMER, *Instructor in Chemistry.*
B.S., M.S., Michigan State College.

GEORGE MOTLEY OLIVER, *Instructor in Chemistry.*
A.B., M.S., University of North Carolina.

GEORGE TIMOTHY O'NEILL, *Associate Professor of Economics.*
B.A., M.A., University of Maryland; M.B.A., Harvard Graduate School of Business Administration.

WILLIAM AUGUSTUS PAGE, *Instructor in Physics.*
B.S., Davidson College; M.S., University of North Carolina.

EDWIN HUGH PAGET, *Associate Professor of English.*
B.L., Northwestern; M.A., University of Pittsburgh.

GERALD PALEVSKY, *Instructor in Civil Engineering.*
B.S. in C.E., Virginia Polytechnic Institute.

HUBERT VERN PARK, *Associate Professor of Mathematics.*
A.B., Lenoir Rhyne College; M.A., Ph.D., University of North Carolina.

JOHN MASON PARKER, III, *Associate Professor of Geology.*
A.B., A.M., Ph.D., Cornell University.

RICHARD WASHINGTON PARKER, *Instructor in Military-Science and Tactics.*
Master Sergeant, Signal Corps, U. S. Army.

WILLIAM ALONZO PARKER, *Instructor in Physics.*
A.B., Davidson College.

JAMES REID PATTERSON, *Instructor in Physics.*
B.S., Davidson College; M.A., Duke University.

JAMES WELCH PATTON, *Professor of History and Political Science.*
A.B., Vanderbilt University; A.M., Ph.D., University of North Carolina.

JEHU DEWITT PAULSON, *Professor of Architecture.*
B.F.A., Yale University.

PAUL PEACH, *Associate Professor, Institute of Statistics.*
Columbia University.

ROBERT JAMES PEARSALL, *Assistant Professor of Electrical Engineering.*
B.E., N. C. State College.

FREDERICK THOMAS PEIRCE, *Director of Textile Research.*
B.S., D.S., University of Sydney (Australia).

MISS MARY MILDRED PENNEY, *Instructor in English.*
B.S., Winthrop College; M.S., N. C. State College.

DANIEL MCLEOD PETERSON, *Assistant Professor of Mathematics.*
B.A., University of Mississippi; M.A., Duke University.

WALTER JOHN PETERSON, *Professor of Animal Nutrition.*
B.S., M.S., Michigan State College; Ph.D., University of Iowa.

HOWARD ALDRIDGE PETREA, *Instructor in Mathematics.*
B.S., Guilford College.

JOHN C. PIERCE, JR., *Assistant Professor in Animal Husbandry.*
B.S., N. C. State College.

*WALTER HENRY PIERCE, *Research Assistant Professor of Agricultural Economics.*
B.S., N. C. State College.

FREDERICK PHILIPS PIKE, *Associate Professor of Chemical Engineering.*
B.S. in Ch.E., University of Virginia; S.M., Massachusetts Institute of Technology.

VALENTIN ADOLF PIKNER, *Instructor of Economics.*
Dipl-Kaufm.: Ph.D., University of Frankfurt.

JOSHUA PLUMMER PILLSBURY, *Professor Emeritus of Architecture.*
B.S., Pennsylvania State College.

JOSEPH ALEXANDER PORTER, JR., *Associate Professor of Textiles.*
B.S., N. C. State College.

SARAH PORTER, *Research Instructor in Experimental Statistics.*
A.B., Meredith College.

GEORGE NEAL PRESTRIDGE, *Instructor in Military Science and Tactics.*
Master Sergeant, Infantry, U. S. Army.

EDWARD ST. CLAIR PUGH, JR., *Assistant Professor of Architecture.*
B.S., N. C. State College; Registered Architect.

KENNETH DALE RAAB, *Assistant Professor of History and Political Science.*
A.B., A.M., University of Illinois.

GLENN ORVICE RANDALL, *Professor of Horticulture.*
B.S., University of Arkansas; M.S., Iowa State College.

J. FIELDING REED, *Professor of Agronomy.*
B.S., M.S., Ph.D., Louisiana State University.

WILLIS ALTON REID, *Associate Professor of Chemistry.*
B.S., Wake Forest College; Ph.D., Wisconsin University.

* On leave 1947-48

ROBERT BARTON RICE, *Professor of Diesel and Internal Combustion Engines.*
B.S., Tufts College; A.M., Columbia University; M.E., Tufts College.

EDITH IMOGENE RIDDICK, *Instructor of Modern Languages.*
A.B., Randolph Macon Woman's College; M.A., University of North Carolina.

JACKSON ASHCRAFT RIGNEY, *Professor of Experimental Statistics.*
B.S., New Mexico State College; M.S., Iowa State College.

WILLIAM EDWARD ROBERTS, *Assistant Professor of Economics.*
A.B., State University of Iowa; A.M., University of Missouri.

WILLIAM MILNER ROBERTS, *Professor of Dairy Manufacturing.*
B.S.A., University of Tennessee; M.S., Ph.D., University of Minnesota.

HAROLD FRANK ROBINSON, *Assistant Professor of Experimental Statistics.*
B.S., M.S., N. C. State College.

NEWTON J. ROBINSON, *Assistant Professor of Religion.*
A.B., Southwestern University; B.D., Texas Christian University.

HENRY ROMANEK, *Assistant Professor of Military Science and Tactics.*
Captain, U. S. Army; B.S., U. S. Military Academy; M.S., Cornell University.

CHARLES VICTOR RUE, *Instructor of Ceramic Engineering.*
B.Cer.E., N. C. State College.

ROBERT HENRY RUFFNER, *Professor of Dairy Husbandry.*
B.S., University of Maryland; M.S., N. C. State College.

DONALD JACOB RULFS, *Assistant Professor of English.*
A.B., University of North Carolina; M.A., Harvard University; Ph.D., University of North Carolina.

HENRY AMES RUTHERFORD, *Head, Department of Textile Chemistry and Dying.*
B.S., Davis and Elkins College; M.A., George Washington University.

BURTON MALCOLM SAPIN, *Instructor in Social Studies.*
A.B., Columbia College; A.M., Columbia University.

GEORGE HOWARD SATTERFIELD, *Professor of Chemistry.*
A.B., A.M., Duke University; B.S., N. C. State College.

IRA OBED SCHAUB, *Director of Agricultural Extension.*
B.S., N. C. State College; D.Sc., Clemson College.

ROBERT SCHMIDT, *Associate Professor of Horticulture.*
B.Sc., Rutgers University.

EDWARD MARTIN SCHOENBORN, JR., *Professor of Chemical Engineering.*
B.Ch.E., M.S., Ph.D., Ohio State University.

HERBERT TEMPLE SCOFIELD, *Associate Professor of Botany.*
A.B., Ph.D., Cornell University.

LOUIS WALTER SEEGERS, *Associate Professor of History and Political Science.*
A.B., Muhlenberg College; A.M., University of Pennsylvania.

JOHN FRANK SEELY, *Assistant Professor of Chemical Engineering.*
B.S., M.S., N. C. State College.

WALTER EUGENE SELKINGHAUS, *Associate Professor of Mechanical Engineering.*
B.S., Newark College of Engineering; M.M.E., N. C. State College.

WILLIAM HENRY SEMPLE, *Instructor in Civil Engineering.*
S.B. in C.E., Massachusetts Institute of Technology.

NATHAN RUSSELL SEWELL, *Research Assistant in Engineering Research.*
B.S. in Cer.E., Georgia School of Technology; M.S. in Cer.E., Missouri School of Mines.

*JAMES ATKINS SHACKFORD, *Instructor in English.*
B.A., Emory and Henry College; M.A., Peabody College.

CLIFFORD A. SHADY, *Instructor in Military Science and Tactics.*
Technician Fourth Grade, Field Artillery, U. S. Army.

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* On Leave, 1947-48.

PETER SHAHDAN, *Instructor in Mathematics.*
Ph.B., Brown University.

MISS DORIS REBECCA SHARPE, *Instructor in English.*
A.B., Woman's College of U. N. C.; M.A., University of North Carolina.

ALFRED BERNARD ROWLAND SHELLEY, *Assistant Professor of English.*
B.S., Tufts College; A.M., Harvard University.

JOHN HARVEY SHERMAN, *Assistant Professor of Electrical Engineering.*
A.B., University of Tampa; M.S. in E.E., Lehigh University.

FRANCIS WEBBER SHERWOOD, *Professor of Animal Industry.*
B.S., M.S., N. C. State College; Ph.D., Cornell University.

CLARENCE BINDER SHIMER, *Assistant Professor of Military Science and Tactics.*
Major, Infantry-Reserve, AUS; B.S., N. C. State College; Graduate, Command and General Staff School.

WILLIAM EDWARD SHINN, *Head, Knitting Department, School of Textiles.*
B.S., M.S., N. C. State College.

MERLE FRANKLIN SHOWALTER, *Associate Professor of Chemistry.*
A.B., Indiana University; M.S., Purdue University.

CLARENCE BONNER SHULENBERGER, *Professor of Accounting.*
A.B., Roanoke College; A.M., Columbia University.

MEREDITH LEE SHUMAKER, *Instructor in Dairy Manufacturing.*
B.S.A., N. C. State College.

RICHARD KEITH SHUMAKER, *Research Assistant in Engineering Research.*
B.M.E., N. C. State College.

ROSS SHUMAKER, *Professor of Architecture.*
B. Arch., Ohio State University; Registered Architect.

IVAN VAUGHAN DETWEILER SHUNK, *Professor of Botany.*
A.B., A.M., University of West Virginia; Ph.D., Rutgers University.

EDMUND SIWIK, *Instructor in Air Science and Tactics.*
Master Sergeant, Air Corps, U. S. Army.

GEORGE KELLOGG SLOCUM, *Associate Professor of Forestry.*
B.S., M.S., N. C. State College.

BENJAMIN WARFIELD SMITH, *Associate Professor of Agronomy.*
B.A., M.A., University of Virginia; Ph.D., University of Wisconsin.

CLYDE FUHRIMAN SMITH, *Professor of Entomology.*
B.S., M.S., Utah State Agricultural College; Ph.D., Ohio State University.

GEORGE WALLACE SMITH, *Professor of Engineering Mechanics.*
B.S.E.E., University of North Carolina; M.S.E. in C.E., D.Sc., University of Michigan.

WILLIAM EDWARD SMITH, *Instructor in Physical Education.*
B.S., Western Carolina Teachers College; M.A, University of North Carolina.

MARVIN LUTHER SPECK, *Associate Professor of Dairy Manufacturing.*
B.S., M.S., University of Maryland; Ph.D., Cornell University.

HERBERT E. SPEECE, *Instructor in Mathematics.*
B.A., York College; M.A., Texas Christian University.

MISS MARY JAMES SPRUILL, *Instructor in English.*
A.B., M.A., University of North Carolina.

RAYMOND FRANKLIN STAINBACK, *Associate Professor of Physics.*
B.S., M.S., University of North Carolina.

RICHARD CLARK STERNE, *Instructor in Social Studies.*
A.B., Columbia College.

WILLIAM DAMON STEVENSON, JR., *Associate Professor of Electrical Engineering.*
B.S.E., Princeton University; B.S. in E.E., Carnegie Institute of Technology; M.S., University of Michigan.

HAMILTON ARLO STEWART, *Professor of Animal Husbandry.*
B.S., M.S., Kansas State College; Ph.D., University of Minnesota.

EDWARD HOYLE STINSON, *Instructor in Mechanical Engineering.*
B.S., N. C. State College.

CHARLES FREDERICK STOBEL, *Associate Professor of Mathematics.*
A.B., A.M., University of Buffalo; Ph.D., University of Illinois.

CLYDE SPURGEON STROUP, *Instructor in Physics.*
B.S., Davidson College.

JASPER LEONIDAS STUCKEY, *Professor of Geology.*
A.B., A.M., University of North Carolina; Ph.D., Cornell University.

ISSAC WEBB SURRATT, *Instructor in Social Studies.*
A.B., Hampden-Sydney; M.A., University of Virginia.

PAUL PORTER SUTTON, *Professor of Chemistry.*
Ph.D., John Hopkins University.

LOUIS HALL SWAIN, *Assistant Professor of English.*
A.B., A.M., Duke University.

NORMAN VIRGIL SWENSON, *Instructor in Mathematics.*
B.S., Bethany College.

NORMAN CARROLL TETER, *Assistant Professor of Agricultural Engineering.*
B.S., University of Missouri; M.S., Iowa State College.

HORACE CARTER THOMAS, *Instructor in Military Science and Tactics.*
Master Sergeant, DEML, U. S. Army.

WALTER ALDINE THOMASON, JR., *Assistant Professor of Textiles.*
B.S., N. C. State College.

CLARENCE A. THOMPSON, JR., *Assistant Professor of Military Science and Tactics.*
Captain, U. S. Army; B.S., Hampden-Sydney College.

OLIVER GEORGE THOMPSON, *Instructor of Economics.*
A.B., Wofford College.

EDWIN GILBERT THURLOW, *Professor of Landscape Architecture.*
B.S., N. C. State College; M.L.A., Harvard University; Charles Eliot Traveling Fellow in Landscape Architecture.

MISS DORIS TILLERY, *Instructor in Mathematics.*
B.A., Meredith College; M.A., Duke University.

ROBERT TINNEN TROXLER, *Instructor in Mechanical Engineering.*
B.S., N. C. State College.

ROBERT WESLEY TRUITT, *Assistant Professor of Aeronautical Engineering.*
A.B., Elon College.

MRS. HULDAH BRINKLEY TURNER, *Instructor in English.*
A.B., Woman's College, U. N. C.; M.S., N. C. State College.

DEROY TYLER, *Instructor in Military Science and Tactics.*
First Sergeant, Quartermaster Corps, U. S. Army.

WILLIAM GARDNER VAN NOTE, *Director; Engineering Research; Research Professor of Metallurgy.*
B.Ch.E., Rensselaer Polytechnic Institute; M.S., University of Vermont; Ph.D., Pennsylvania State College.

LILLIAN LEE VAUGHAN, *Professor of Mechanical Engineering.*
B.S., N. C. State College; M.E., Columbia University.

WILLIAM JOHN DOOLEY VAUGHAN, *Assistant Professor of Military Science and Tactics.*
Major, Infantry, U. S. Army; B.S., United States Military Academy.

JAMES GRAHAM WALL, *Instructor in Mathematics.*
A.B., M.A., University of North Carolina.

MRS. AURELIA DUNSTAN WALLACE, *Instructor in English.*
A.B., M.A., University of Georgia.

EDMOND MEREDITH WALLER, *Assistant Professor of Physical Education and Assistant Coach.*
A.B., Vanderbilt University; M.A., Peabody College.

RICHARD GAITHER WALSER, *Assistant Professor of English.*
A.B., M.A., University of North Carolina.

GEORGE CARSON WATSON, *Assistant Professor of Mathematics.*
A.B., Randolph Macon College; M.A., University of Virginia.

ROBERT KENNETH WAUGH, *Associate Professor of Dairy Husbandry.*
B.S.A., M.S., Ph.D., Purdue University.

DAVID STATHEM WEAVER, *Professor of Agricultural Engineering.*
B.S., Ohio State University; M.S., N. C. State College.

BERTRAM WHITTIER WELLS, *Professor of Botany.*
A.B., M.A., Ohio State University; Ph.D., University of Chicago.

JOSEPH ARTHUR WEYBREW, *Associate Professor of Animal Nutrition.*
B.S., M.S., Kansas State College; Ph.D., University of Wisconsin.

FRED BARNETT WHEELER, *Professor of Practical Mechanics and Superintendent of Shops.*
B.S., M.E., N. C. State College.

LINSAY R. WHICHARD, *Instructor in English.*
A.B., East Carolina Teachers College.

RAYMOND CYRUS WHITE, *Assistant Professor of Chemistry.*
B.S., Davis Elkins College; M.S., Ph.E., West Virginia University.

JOSEPH B. WHITENER, *Instructor in Military Science and Tactics.*
Master Sergeant, Infantry, U. S. Army.

JOHN KERR WHITFIELD, *Instructor in Mechanical Engineering.*
B.M.E., N. C. State College.

LARRY ALSTON WHITFORD, *Associate Professor of Botany.*
B.S., M.S., N. C. State College; Ph.D., Ohio State University.

†RONALD LUTHER WIGGINS, *Associate Professor of Industrial Engineering.*
B.Adm.Engr., M.S., Syracuse University; LL.B., George Washington University.

MRS. RUTH MUSSER WIGGINS, *Instructor in Physics.*
A.B., Goucher College; M.A., John Hopkins University.

EUGENE ARTHUR WILKENING, *Instructor of Rural Sociology.*
B.S., M.A., University of Missouri.

FREDERICK ROBERTS WILLARD, *Instructor in Electrical Engineering.*
B.Eng., University of Toledo.

HARVEY PAGE WILLIAMS, *Professor of Mathematics.*
B.A., William and Mary College; M.A., Duke University.

IRA LAWSON WILLIAMS, *Associate Professor of Agricultural Engineering.*
B.S., Texas A. & M. College; M.S., Iowa State College.

JACK ALFRED WILLIAMS, *Instructor in Engineering Mechanics.*
B.S., C.E., Virginia Polytechnic Institute.

LEON FRANKLIN WILLIAMS, *Professor of Chemistry.*
A.B., A.M., Trinity College; Ph.D., John Hopkins University.

MORLEY JEFFERS WILLIAMS, *Professor of Landscape Architecture.*
B.S.A., University of Toronto; M.L.A. in C.P., Sheldon Traveling Fellow, Harvard University.

NORWOOD WADE WILLIAMS, *Assistant Professor of Poultry Science.*
B.S., M.S., N. C. State College.

ALFRED EDWARD WILLIAMSON, JR., *Associate Professor of Civil Engineering.*
B.E. in M.E, University of Maryland; M.S.S.E., University of North Carolina.

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* Resigned March, 1948.

ARTHUR JOHN WILSON, *Professor of Chemistry.*
B.S., M.S., N. C. State College; Ph.D., Cornell University.

THOMAS LESLIE WILSON, *Assistant Professor of English.*
A.B., Catawba College; A. M., Wofford College.

WILLIAM WILSON, *Professor of Physics.*
B.Sc., M.Sc., D.Sc., Manchester University; B.A., Cambridge University.

MERLE WESLEY WING, *Assistant Professor of Zoology.*
B.S., University of Maine.

EDWIN WEEMS WINKLER, *Assistant Professor of Electrical Engineering.*
S.B., Montana State College; M.S., University of North Carolina.

SANFORD RICHARD WINSTON, *Professor of Sociology.*
A.B., Western Reserve University; Ph.D., University of Minnesota.

LOWELL SHERIDAN WINTON, *Professor of Mathematics.*
B.S., Grove City College; M.A., Oberlin College; Ph.D., Duke University.

MISS PEGGY THOMPSON WITHERINGTON, *Instructor in Mathematics.*
A.B., Salem College.

THOMAS WILMONT WOOD, *Professor of Industry and Personnel Management.*
B.S., A.M., University of Alabama; Ph.D., University of North Carolina.

LENTHALL WYMAN, *Professor of Forestry.*
A.B., M.F., Harvard University.

WILLARD KENDALL WYNN, *Assistant Professor of English.*
A.B., Wofford College; M.A., Emory University; M.A., Columbia University.

ROBERT BAKER WYNNE, *Assistant Professor of English.*
A.B., M.A., William and Mary College.

GENERAL INFORMATION

THE COLLEGE

Establishment.—The North Carolina State College of Agriculture and Engineering is one of the Land-Grant Colleges established under the provisions of the Morrill Act, passed by the Congress of the United States, June 2, 1862. The first session of the College was that of 1889-1890. Prior to that date, the funds received by the State under the Land-Grant Act had been used by the University of North Carolina, at Chapel Hill.

The name, The North Carolina College of Agriculture and Mechanic Arts, used in the establishment of the College, was changed by the General Assembly—the Legislature of the State—in 1917 to its present form.

In its session of 1931, the General Assembly passed an Act, of which the following is the first section: "That the University of North Carolina, the North Carolina State College of Agriculture and Engineering, and the North Carolina College for Women are hereby consolidated and merged into 'The University of North Carolina'."

This Act placed the three institutions under one Board of Trustees and one President, the separate affairs of each institution being in charge of its own Chancellor. The effect of the Act, by correcting unnecessary duplication and focalizing the work of each of its members, has tended to create a strong, unified State University.

Location.—State College Campus of one hundred twenty-five acres, lies within the limits of Raleigh, a mile and a quarter west of the State Capitol, on United States Highway, Route 1. Adjoining the Campus westward, occupying four hundred forty-five additional acres, are the College poultry yards, and the Central State Experiment Farms. A mile still farther westward, the College has acquired a tract of thirteen hundred acres, which is maintained as livestock farms by the Department of Animal Husbandry and Dairying. The part of this tract—about 500 acres—not adapted for these farms is being used by the Department of Forestry for demonstrations and development.

Organization.—The organization of State College has as its objectives Campus Teaching, Extension Teaching, and Research.

Campus Teaching occupies the School of Agriculture and Forestry, the School of Engineering, the Division of Teacher Education, the Textile School, the Graduate Division, the Basic Division, and the Summer Session. The Schools and the Basic Division are organized for teaching by Departments. The details of the organization, the equipment, and the work of each School and Department are given under the various headings in the latter pages of this Catalog. The work of the Summer Session is set forth in a special issue of State College Record.

The Department of Military Training, including as the Reserve Officers Training Corps students of all classes in all Schools, is placed immediately under the College Administration.

Extension Teaching is directed under the Division of College Extension. The work is closely coördinated with the work in the regular Departments of the College. In certain short courses, most of them in Agriculture and in Engineering, Extension overlaps with Campus Teaching. The whole State is covered in the activities of the Agricultural Extension Service.

Research is conducted, by individuals or by Departments, very generally at State College. Specially organized work is done through the Agricultural Experiment Station, the Engineering Experiment Station, and the Textile Research Department.

The Campus.—The Campus of State College presents an agreeably rolling terrain with adequate space west and south for expansion. Located on the eastern edge of the Piedmont Region of the State, within twenty-five miles of the Coastal Plain, opportunity is afforded for a pleasing variety of trees and shrubs in the landscaping. Fortunately, in the early years of the College a long-range plan for growth was made. This plan is now being intelligently followed.

Under the sections of the Catalog devoted to Schools and their Departments and to Divisions, are placed descriptions of buildings, laboratories, and facilities of each of these.

General Service Buildings.—Holladay Hall, named for Colonel Alexander Quarles Holladay, first President of the College, 1889-1899, contains the general administrative offices of the College, and the offices and classrooms of the Military Department.

The D. H. Hill Library, named for Doctor Daniel Harvey Hill, President of the College, 1908-1916, was dedicated in 1926. It contains now over 80,000 volumes, exclusive of Government documents, and pamphlets.

The Y. M. C. A. building, the erection of which was made possible by a donation from the Rockefeller Foundation, serves the religious and social life of the College.

The Dining Hall, an H-shaped building, with kitchens, storage rooms, pantries, refrigerators, and other mechanical devices in the center and basement, has at each side, front and rear, a spacious dining hall. The service is on the cafeteria plan.

The Frank Thompson Gymnasium, named in honor of Frank Martin Thompson, distinguished athlete, graduate of State College, Class of 1910, killed in service during World War I, is thoroughly equipped and modern in all its appointments.

The Infirmary, completed for Army use during the war, is a model of a small, special hospital.

Pullen Hall, named in honor of R. Stanhope Pullen, donor of the first sixty acres of the College land, has classrooms on the first and basement floors, on the second floor, the College auditorium.

The Power Plant, recently erected, centrally located, furnishes heat, electric power, and hot water to all buildings on the Campus using these services.

Eleven College Dormitories now in use accommodate approximately 1400 students. Other students room in homes in the vicinity of the Campus and in fraternity houses. Full information in regard to dormitories is sent by the Registrar to applicants accepted for admission to the College, or by the Superintendent of Dormitories.

INFORMATION FOR APPLICANTS

I. Admission

1. The first step toward admission to State College is to get from the Registrar, who is to be addressed at State College Station, Raleigh, a certificate blank. After the blank has been filled out and signed by the principal or the superintendent of the high school or other preparatory school, the certificate is sent to the Registrar for his decision on admission, notice of which will be given promptly.

The certificate must contain a statement from the school last attended of the good moral character of the applicant.

2. Undergraduate students may be admitted as regular or special.
   (1) A regular student is one who is registered in a four-year curriculum.
   (2) Women may be admitted as regular students provided they register in one of the regular curricula.
   (3) A special student is a person of mature age already engaged in some vocation in which instruction is desired. Such person may, upon presenting a satisfactory record of education and upon recommendation of the Dean of the School concerned, be admitted without the usual entrance requirements.
   Special students are not eligible for a degree, nor does work done as a special student have value for credit toward a degree. A special student cannot represent the College in any intercollegiate contest nor become a member of a fraternity.

3. Requirements for admission of regular students.
   (1) Sixteen years is the minimum age for admission.
   (2) Graduation from a State accredited high school, or an approved preparatory school, and fifteen units of credit, specified and elective as indicated below, are required for admission to the freshman class of four-year courses.
   (3) Applicants graduated by non-accredited four-year high schools in North Carolina may be admitted by passing successfully an entrance examination such as that prepared by the Examination Committee of the North Carolina College Conference.
   (4) In exceptional instances a person of mature age may be admitted by the Dean of a School on the basis of his ability to carry the regular work of a curriculum in that School.

(5) Subjects and units of credit (A unit is allowed for a subject pursued for a year, five periods a week, each period being at least forty minutes, and successfully passed in a high school accredited by the North Carolina State Department of Public Instruction or other preparatory school accredited by competent authority.):

	Units of Credit
English: Grammar, Composition, Literature	4
†History: United States or equivalent	1
Algebra	1.5
Plane Geometry	1
*Solid Geometry	.5
Science	1

The remainder of the required fifteen units will be accepted from the academic record presented except that not more than a total of one unit will be accepted for activity courses such as physical education, music, band, and military science.

(6) Foreign students who do not have a satisfactory command of the English language will be required to attend a non-credit English course until they acquire a mastery of English. This course will include vocabulary training in the student's major field of study.

(7) **No student with a deficiency in Plane Geometry will be admitted to the Engineering School.**

4. Admission of Non-Resident Students. Admission of students who are not residents of North Carolina will be considered according to the number of such students who can be admitted and the scholastic standing of the individual student.

5. Advanced standing is allowed on work done in approved colleges upon presentation of a certificate or transcript, duly signed and sealed, to the Director of Registration. The transcript is evaluated in the Registration Office to determine the maximum amount of credit and is then sent to the Dean of the school concerned for a detailed evaluation of credits which can be used in the curriculum selected. No applicant will be considered unless his previous college grades indicate that he has at least an average scholastic ranking. This is usually interpreted as a "C" average.

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* Solid Geometry is required only in the School of Engineering and in Agricultural Engineering. A special course is offered in college for applicants who do not present this credit for entrance. No college credit is allowed for the course.

† A student not offering for credit History of the United States is required to take the subject in his College course.

Because of the scholastic requirements imposed upon resident students, advanced standing credit cannot be allowed for courses passed at other institutions with the lowest passing letter grade, or corresponding numerical grades. At least one year in residence is required for a degree.

II. Expenses

Undergraduate

1. The total College expenses of a student resident of North Carolina need not for the regular College year exceed $750.00, for a nonresident of this State, $920.00. These amounts include the cost of room, an estimate for board, heat and lights, tuition, fees and deposits, books, drawing instruments, laundry, and necessary incidentals. They do not include clothing, pocket money, or other incidentals.

2. Nonresidents of North Carolina pay an additional tuition charge. The College Administration has defined a nonresident student as a person who comes into North Carolina from another state for the purpose of attending college.

In order to draw a clear line between resident and nonresident students, the Administration has ruled that all students whose parents have not been domiciled in North Carolina for more than six months immediately preceding the day of their first enrollment in the institution shall be termed nonresident students, with the following exceptions:

(1) Students twenty-one years of age at the time of their first matriculation who have resided in North Carolina for more than one year preceding the day of their first enrollment.

(2) Children of regular employees of the Federal Government stationed in the State of North Carolina.

(3) Children of regular employees of the Federal Government who are employed outside of the State, but who through law are permitted to retain their North Carolina citizenship.

Students cannot claim a change in their resident status after matriculating. Students furnishing incomplete or incorrect information in order to obtain the special State-resident status shall be liable for dishonorable dismissal.

3. Applications for credit must be made to the Business Office of the College prior to registration day. Applications made later, if granted, will require a special fee of $2 and possibly also the fee for late registration.

4. For each failure to meet deferred payments as scheduled, a fee of $5 is charged.

5. Tuition and fees for residents of North Carolina as regular undergraduates or as special students scheduled for more than nine credit hours are as follows:

	Fall Quarter	Winter Quarter	Spring Quarter
Tuition	$30	$30	$30
College Fees	26	26	26
Student Activities	4	3	2
Athletic Fee	8	5	2
Students Fees	2	2	
General Deposit	20		

Student Fees include subscription to student publications of the school in which registered.

Note.—**Tuition and Fees are subject to change by the Board of Trustees without advance notice.**

6. The general deposit, in case of first year men, will be charged with cost of necessary expendable Military Supplies, such as shoes, books, etc. The balance of this deposit, in the case of all students, is refundable at the end of the year, after covering loss of, or excessive breakage of College property, or other indebtedness to the College.

7. Non-residents of North Carolina (in all curricula) will pay an additional $66.00 Tuition per quarter.

8. Expenses also include the following: Room rent, from $18 to $30 per quarter; Books and Supplies, (estimated), $20 to $35 per quarter; for those taking drawing, instruments, etc. (estimated) $17.50 to $35 (these intruments should, with proper care, last throughout one's stay in college).

9. College fees include those for registration or matriculation ($5.00, in no case refundable), for hospital and medical attention, for library and lectures, for laboratories and classrooms, and for physical education.

10. Student-activities fees include those for student government, student publications, and general student activities.

11. Forestry Field Laboratory Fees:

Freshmen in Forestry will pay a $5.00 Field Laboratory fee at first term registration. Sophomores in Forestry will be charged a $20.00 Field Laboratory fee upon attendance of the required Sophomore Summer Camp (in College Forests). Juniors in Forestry will be charged a $40.00 Field Laboratory fee upon registration for the third term of their junior year. Seniors in Forestry will be charged a $10.00 Field Laboratory fee in the first term of their Senior year.

NOTE: These Field Laboratory fees are necessary to cover extra costs of supplies, equipment, and travel for off-campus field work required in the Forestry curriculum.

12. Audits: In the regular term, all regularly registered students are entitled to audit one course for no additional charge (academic permission must be secured from Dean of School). A charge of $5.00 will be made for each additional audit scheduled.

13. Reservation of a room and the payment of room rent must be paid on or before date designated at time of room assignment. A reservation may be cancelled and the payment refunded upon notice before September 1, not later. Information about rooms may be had by writing the Superintendent of Dormitory Rentals.

14. Dormitory rooms have necessary furniture, but each student must bring his own blankets, bed linen, and towels.

15. Board at the College Cafeteria may be paid in cash for each meal, or in tickets sold at the Cafeteria in books of $5.00 value for the convenience of students.

16. Applicants who desire information regarding part-time employment should address their inquiries to the Self-Help Secretary, College Y.M.C.A.

17. A refund of the amount paid the College, less the registration fee and a reasonable charge for lodging and services, is made to a student withdrawing within ten days from the date of registration; on withdrawal later, no refund will be made except of the general deposit.

18. Freshmen, unless living at home with their parents, may be required to room in specified College dormitories. Students are not permitted to live in fraternity chapter houses during their freshman year.

19. Diploma Fee. All candidates for a Baccalaureate Degree are charged a Diploma Fee of $7.00 during the last term before the degree is awarded.

20. When a Transfer student has been approved for admission, a $2.00 Transcript Fee will be requested. This is non-refundable and is in addition to other fees (this fee should not be sent until requested).

Graduate and Special Students

1. Graduate students in residence will pay a $2.00 registration fee for each registration, $4.00 per credit hour for all courses scheduled ($6.00 for non-residents), and $10.00 for the Diploma. Full-time graduate students will pay the same Medical, Athletic, and Student Activities Fees as those charged undergraduate students.

2. Special students, or regular students, will pay a $2.00 registration fee for each registration and $4.00 per credit hour ($6.00 for non-residents) for all courses scheduled totaling nine hours or less. Those scheduling more than nine hours will pay regular fees. The payment of Student Activity fees is optional with Special students or regular students carrying nine hours or less. Special students do not receive academic credit.

III. Registration

1. Upon his arrival on the campus each candidate of the freshman class is given a schedule of the exercises of the first week, known as Freshman Week.

2. The notice of admission approved beforehand by the Registrar for the School and the Department in which the applicant wishes to register must be ready for presentation.

3. The dates indicated in the College Calendar for the registration of freshmen, of those applying for advanced credit, and of sophomores, juniors, seniors, and graduate students, must be strictly observed.

4. For registration after the scheduled date, an extra fee of $2 is required for the first day and $1 for each additional day until a maximum of $10 is reached.

Special Note to Freshmen and Transfer Students

Because of the testing program given during freshman week to all new students (except those with forty-five or more term credits of advanced standing), it is essential that all new students report on time. Late admissions cause a great deal of extra labor and expense. Therefore, all new students (except transfer students with forty-five or more term credits of advancd standing) will be charged a $2 fee for each test missed during freshman week. This charge is made because of the extra time which must be given to late individuals. The regular late fee regulations will apply to transfer students having forty-five or more term credits of advanced standing, who do not begin their registration on the date indicated. New students should plan to arrive on the campus on the day preceding the registration date in order to be available at 8:00 a.m. on registration day.

5. Directions in detail for registration are furnished each student. The student is expected to follow these directions.

6. Vaccination against smallpox is required at the time of registration unless the applicant furnishes a doctor's certificate indicating he has been successfully vaccinated within two years preceding his registration.

7. Inoculation against typhoid fever, though not compulsory, is urgently suggested for those entering the College. Free inoculation is offered by the College to all students.

8. All new students will be given the Tuberculin Skin Test unless they present a statement from their family physician indicating that such a test has been taken during the past year.

9. Admission to classes is permitted only after complete registration certified on the official card of the Registrar. All instructors will enforce this rule.

10. Students may drop and add courses during a specified period at the beginning of each term by filing in the Office of Registration a roster change slip signed by their Dean, Adviser, and the instructors concerned. There is a charge of fifty cents for such changes made after registration day. Credit is not allowed for changes unless they are made in this manner.

11. Students may change from one curriculum to another by filing in the Office of Registration a curriculum change card signed by the Dean or Deans concerned. Such changes are effective at the beginning of the following term.

IV. Grades and Honor Points

1. Grading System:
   A—Excellent, 90-100.
   B—Good, 80-89.
   C—Passing, 70-79.
   D—Passing (without credit points), 60-69.
   F—Failure, below 60. (Required courses failed must be repeated.)
   Abs.—Absent from examination. (Equivalent to failure unless excused.

   Inc.—Incomplete. (An "Inc." grade must be completed during the next term a student is in residence unless the department concerned is not able to allow the make up. In the latter case, the student must make up the "Inc." during the first term satisfactory to the department. An "Inc." grade not made up as indicated will be changed to a grade of "Fi.")

2. Honor or quality points are determined by the grade:
   A—3 points for each credit hour.
   B—2 points for each credit hour.
   C—1 point for each credit hour.
   D—No points.
   F—Minus one point for each credit hour.

3. Mid-term reports for students who are failing any subject enable advisers and deans to counsel students concerning their scholastic difficulties.

4. Seniors who fail a course within three terms (summer school counts as one term) of their graduation, may, if they have failed only one course, apply to the Office of Registration for permission to remove the failure by taking a re-examination on that course.
   a. If, however, a senior fails more than one course during one term and removes all but one of these deficiencies by repeating the course or courses and if he has had no other re-examination that year, he may apply at the end of his last term in residence for permission to take a re-examination to remove that failure.
   b. Permission to take any re-examination must be obtained from the Office of Registration, and a fee of $3.00 must be paid to the Business Office for each re-examination.
   c. If the re-examination is passed, a notation of "R" is entered on the permanent record, and credit is allowed for the course. This is equivalent to a "D" grade.

V. Scholarship Rules

1. a. For the period comprising the first three terms in residence, a student will be dropped from the rolls of the college at the end of any term in which he fails to pass at least six hours of work.

Furthermore, he will be dropped at the end of this three-term period if he fails to pass a total of at least thirty hours.

b. For the periods comprising the fourth, fifth, and sixth terms in residence, a student will be dropped at the end of any term in which he fails to pass at least eight hours. Furthermore, he will be dropped at the end of this three-term period if he fails to pass a total of at least thirty-five hours.

c. For the remaining periods comprising three terms each, a student will be dropped at the end of any term in which he fails to pass at least ten hours. Furthermore, he will be dropped at the end of any three-term period in which he fails to pass a total of at least forty hours.

2. a. The summer sessions will not be considered as a part of any of the above periods. However, hours passed in a summer session may be included in the total of hours for the preceding period only.

b. Transfer students who have attended college for fewer than three terms (or equivalent) will be regarded as entering the first term for purposes of these rules; those who have attended college for three terms or more will be regarded as entering the fourth term.

c. Students who have been dropped for poor scholarship may not re-enter for the fall term of any year.

d. Veterans are excused from the operations of these rules for their first term in residence after being discharged. The rules shall apply thereafter, and the work of that term may be included in the total of hours earned for the first three-term period or re-entering.

3. The re-entrance, after the interval of at least one term, of a student who has failed, shall be determined by the Dean or Director of Instruction of his school upon the basis of maximum scholastic advantage to the student.

4. "C" Average Rule. Before allowing students to enter the third or fourth year, they shall have earned net credit points equal to or greater than the term credits earned. In case of repeated courses, the repeated grade only shall be considered. This rule is applied before the fall term registration only, thus giving students ample time to earn the required points. Any student may attend the summer session at this institution to make up any shortage in points, but may not earn such points through correspondence courses or attendance at other institutions.

5. Honors in Scholarship:

a. Honors in scholarship for the year are awarded those students who earn twice as many credit points as credit hours during the first two terms.

b. High honors in scholarship for the year are awarded those students who earn two and one-half times as many credit points as credit hours during the first two terms.

c. Honors in scholarship at graduation are awarded those students who have earned during their entire residence at this institution twice as many credit points as credit hours.

d. High honors in scholarship at graduation are awarded those students who have earned during their entire residence at this institution two and one-half times as many credit points as credit hours.

e. Public announcement of honors and high honors for the year is made on Scholarship Day and of graduation with honors or high honors at Commencement. Graduation with honors or high honors is also published in the College Catalog and engrossed upon diplomas.

f. Dean's List. Any junior or senior having a cumulative average of "B" or better shall be exempt from the college rule which places a student on probation for excessive absences, and his name shall be placed on a preferred list. Once placed on such preferred list a student must maintain an average of "B" or better during each term he remains in college thereafter, or his name shall be removed from such preferred list and not entered thereon again.

g. Class Attendance Regulations. A student is expected to attend every meeting of each class. Any student who is absent from class three (3) times without a satisfactory reason will lose one (1) quality point. A student who is absent ten (10) times in any term without a satisfactory reason will be placed on probation.

Copies of attendance regulations in detail are available to all students in the Office of Dean of Students.

VI. Classification of Students

1. For the convenience of the college administration and in keeping with custom, regular students are classified as Freshmen, Sophomores, Juniors, Seniors, and Graduates. This classification is made only at the opening of the fall term, or when a student enters for the first time. The following system of classification is used:

Freshman—Less than 45 term credits.
Sophomore—45 credits through 104 credits.
Junior—105 credits through 159 credits.
Senior—160 or more credits.
Graduate—A student who has already received a baccalaureate degree from a recognized college.

This system permits students to skip classifications and graduate as soon as scholastic requirements have been satisfied.

2. Students are promoted from the Basic Division to technical schools when they have earned 105 or more credits, including credit for all freshman requirements, and have a "C" average. Students who have earned as many as 140 credits without completing all freshman requirements are

promoted to technical schools but must complete the remaining freshman courses without credit toward graduation. Transfer students are allowed at least four terms in which to make up freshman deficiencies and still receive credit toward graduation.

VII. Degrees

Since in conferring a degree and awarding a diploma, the College recognizes a student's character as well as his scholarship, the College reserves the right to withhold the degree and diploma for reasons other than unsatisfactory scholarship.

No student may earn more than one degree at any one commencement. In order to be eligible for a second Bachelor's degree, a student must complete a minimum of 36 term credits above the requirements for the first degree. There are, however, no additional residence requirements.

Undergraduate students who transfer from some other institution must spend one year in residence at this institution before being eligible for a degree.

An undergraduate student while not in residence may earn towards a degree not more than fifty term credits by correspondence and not more than sixty by correspondence and extension. Not more than six credit hours may be earned towards graduation after a student's last residence at this institution. Correspondence courses cannot be taken by a resident student unless they are a part of his official schedule approved by his dean.

The college confers the following degrees:

1. The college confers a Bachelor's degree in the student's major field upon the undergraduate student who successfully completes in regular order any of the prescribed curricula.

2. Upon the student who has previously obtained the Bachelor's degree and who successfully completes in regular order at least one year of prescribed graduate work in residence, the College confers a Master's degree in that student's major field.

3. The degree of Doctor of Philosophy in certain specified departments is offered in cooperation with the University at Chapel Hill under supervision of the Graduate School of the Consolidated University of North Carolina.

4. The honorary degree, Doctor of Science, may be conferred upon candidates recommended by the various schools when approved by the General Faculty and the Board of Trustees.

5. A certificate of Meritorious Service in Agriculture may be awarded at Commencement to a bona-fide farmer who has rendered notable service in the advancement of agriculture in his community.

VIII. Financial Aids and Scholarships

1. The Self-Help Secretary of the College Y. M. C. A. (see page 56) will assist those desiring employment to help pay expenses.

2. **A Student Loan Fund**, first established by the State College Alumni Association, amounting now to $34,000, renders assistance to needy students of talent and high character. The Fund includes the **Finley Loan Fund** of $1,000 (see below), the **Masonic Loan Fund**, $4,500, the **Frank M. Harper Loan Fund**. $200, and the **Escheats Loan Fund** of $15,000.

At present, loans, restricted largely to juniors and seniors, are made at 6 percent on good security. Since the fund is comparatively small, new loans are usually made only as old ones are repaid.

The Finley Loan Fund is a memorial to William Wilson Finley by the Southern Railway Company, of which Mr. Finley was, at the time of his death, president. It is designated for needy students in Agriculture.

The Student Government Loan Fund is a small loan fund established by the Student Council in 1932 to be loaned to students below the senior class, in small loans (maximum $50.00) and for short periods of time.

3. **The John Gray Blount Scholarships** were endowed by Colonel W. B. Rodman, of Norfolk, Virginia, in memory of his great-grandfather. The maximum value of each of the two scholarships is $195.

4. **"American Hardware Agricultural Scholarship"** is awarded annually by the American Hardware and Equipment Company of Charlotte, North Carolina, to a freshman in the School of Agriculture whose home is in Mecklenburg County. The award carries $200 annually and is awarded by the Faculty Scholarship Committee after recommendations are received by the Association of Vocational Agricultural Teachers of Mecklenburg County.

5. **"The Harvey B. Hunter Scholarship"** was established by H. Bradford Hunter, Jr. and his brother, Charles A. Hunter, of Charlotte, North Carolina, in honor of their father. The value of the Scholarship is $100 annually and is awarded to a freshman in the School of Agriculture from Berryhill High School in Mecklenburg County. Recommendations are made to the Faculty Scholarship Committee by the principal and agriculture teacher of Berryhill High School.

6. **The Burpee Award in Horticulture**—An annual award of $100, established in 1945 by Mr. David Burpee, President, W. Atlee Burpee Company, to assist financially and to recognize outstanding students in Horticulture. The award will be made at the end of the third term of the junior year and will be based upon "scholarship, interest in research and practical experience" of the student. Students majoring in Vegetable Gardening and Floriculture will be given preference.

7. **The North Carolina Cottonseed-Crushers Association offers to 4-H Club** members the following one-year scholarship:

To the member making the best record in a dairy project.

8. The Chilean Nitrate Educational Bureau offers a four-year scholarship to the 4-H Club member in North Carolina making the best record for three or more years in 4-H Club work.

9. The Chilean Nitrate Educational Bureau also offers a hundred scholarships of $5 each: one to the most distinguished Club boy from each of the hundred counties of North Carolina attending the 4-H Summer Short Course at State College.

10. **The Esso Scholarships.** Two four-year scholarships awarded to the boys with the most outstanding records in 4-H work for the current year.

11. **The Farmers' Cooperative Exchange Scholarship.** A one-year scholarship awarded to the boy doing the most outstanding 4-H work in Poultry for the current year.

12. **"The Hulda Johnston Cox Forestry Scholarship"** was established by the Ralph K. Cox Paper Company, of Wellsburg, West Virginia, and Dover, North Carolina. The Scholarship is named to honor the wife of the founder of the company. The Scholarship carries an annual award of $500 and is awarded by the Faculty Scholarship Committee to a sophomore, junior, or senior in the Division of Forestry.

13. **The Syd Alexander Scholarship** was enodwed by Mrs. Mary R. Alexander of Charlotte, North Carolina, in memory of her husband, the late Sydenham B. Alexander, alumnus and trustee of State College. The returns from the endowment—$5,000—are awarded to a student, a native and resident of Mecklenburg County, North Carolina, who is pursuing a course in the School of Textiles of State College.

14. **The Abraham and Charles Erlanger Textile Scholarships.** Memorializing the late Abraham and Charles Erlanger, members of their family have established a trust fund at North Carolina State College of Agriculture and Engineering to provide for the annual award of a four-year scholarship in textiles.

Any son or daughter of an employee of the Erlanger Mills, Inc., in Lexington, N. C., the North Carolina Finishing Company in Salisbury, N. C., the North Carolina Fabrics Company in Salisbury, N. C., and the Alexander Manufacturing Company in Forest City, N. C., on graduation from high school, is eligible to compete for the Erlanger Scholarship.

15. **The Coopers Incorporated Scholarships.** Two four-year scholarships in Textiles established by Coopers Incorporated of Kenosha, Wisconsin. Established to encourage students of Kenosha High School to continue their education. Limited to graduates of the Kenosha High School.

16. **The Luther W. Cartwright, Jr., Memorial Scholarship.** Memorializing the late Luther W. Cartwright, Jr., who gave his life in the service of his country, his father, Lieutenant Commander Luther W. Cartwright, has established a trust fund at the North Carolina State College of Agriculture and Engineering to provide for the annual award of a scholarship to be awarded to a senior in the school of engineering.

17. **The L. Reade Powers Scholarship Fund.** Established by his brother, Dr. F. P. Powers, for the aid of needy students, primarily orphan boys or girls. This is in the nature of a loan fund to needy boys or girls.

18. **The A. F. Greaves-Walker Fellowship Fund** was established by the students of Professor A. F. Greaves-Walker, former Head of the Ceramic Engineering Department. The funds are held by the North Carolina State College Foundation and administered by a Fellowship Committee, the Chairman of which is the Head of the Ceramic Engineering Department.

19. **The North Carolina State College Foundation has a Scholarship and Fellowship Fund.** Money is solicited for this purpose and placed in an endowment, the interest from which is used to grant scholarships as approved by the Board of Directors of the Foundation and the Faculty Scholarship Committee.

20. **Graduate Fellowships** are offered each year by State College, during the current year, thirty-three teaching, twenty-four research fellowships. As the number of these scholarships is limited, application should be made early to the Head of the Department concerned.

21. **Sears-Roebuck Foundation Scholarships.** Awards of $100 or more are made each year to from fifteen to twenty graduates of North Carolina High Schools who wish to enter any curriculum in the School of Agriculture and Forestry or the curriculum in Vocational Agriculture. Preference is given to farm boys and awards are made on the basis of need, scholastic record in high school, participation in 4-H Club or F.F.A. projects, and other community activities. Funds for the scholarships are provided by the Sears-Roebuck Company. Application blanks may be secured from the Dean of Agriculture and must be filed with his office by June 15 each year.

22. **The National Pickle Packers Association Research Fellowship** provides funds for a graduate research fellowship in the Department of Horticulture to study problems related to the industry.

COLLEGE FOUNDATIONS

There are five foundations organized and incorporated under the laws of North Carolina which promote and support various programs of the college.

The North Carolina State College Foundation was incorporated December 11, 1942 to foster and promote the general welfare of North Carolina State College and to receive and administer gifts and donations for such purposes. The Board of Directors is composed of members of the General Alumni Association and members of the Board of Trustees of the Consolidated University of North Carolina.

Among the projects that the State College Foundation has helped to sponsor are the installation of carillonic bells in the Memorial Tower, manufacture and sale of State College plates, the construction of dormitories D and E made possible by a long-term lease from the State of North Carolina and a private loan of $1,100,000 to the Foundation, and is in the midst of a campaign for funds to be used in the construction of an Alumni Memorial Building.

The Agricultural Foundation renders financial assistance in the development of strong teaching programs in agriculture and forestry; assists the Extension Division of the School of Agriculture and Forestry at North Carolina State College in obtaining competent scientists for the research programs in forestry, agricultural engineering, poultry, animal husbandry and nutrition, crops and soils, disease and insect control, marketing and the economics of farming and rural living.

Special Agricultural Foundation Funds

During the period 1938-1947, Mr. Richard J. Reynolds, formerly of Winston-Salem, now of Miami Beach, Florida, contributed $5,000 annually to the School of Agriculture for the purpose of supplementing the salaries of four or five top ranking scientists on the agricultural staff. This fund enabled the College to keep in North Carolina a few leaders in the science of agricultural research. Early in 1948, Mr. Reynolds transferred to the College income-producing securities sufficient to bear an annual income of $5,000.

The North Carolina Dairy Foundation aims to promote and improve all phases of dairying in North Carolina through education, research, and extension. A Board of Directors of sixty handles the affairs of the Foundation, and these directors represent distributors, producers and jobbers.

Special Dairy Foundation Funds

1. **"The Guilford Dairy Professorship of Dairy Production"** has been established by the Guilford Dairy Cooperative Association of Greensboro.
2. **"The Tarheel Supplymen's Professorship in Dairying"** has been set up by the members of the Tarheel Supplymen's Association.

The North Carolina Engineering Foundation objectives are to give financial assistance to teaching, research, and extension in engineering and industry. The Engineering Foundation works closely with large and small corporations and individuals whose business is closely allied with that of engineers and contractors.

Special Engineering Foundation Funds

1. **"The Frank Page Endowed Professorship of Civil Engineering"** has been endowed for a limited number of years by members of the Carolina Road Builders Association to honor the name of the late Mr. Frank Page, first Director of the North Carolina Highway Commission.

2. **"The L. L. Vaughan Professorship of Mechanical Engineering"** was endowed by a fund sponsored by the North Carolina Association of Plumbing and Heating Contractors and named to honor Professor L. L. Vaughan of State College who has been closely associated with that industry for over twenty-five years.

3. **"The Walter Clark Professorship of Industrial Engineering"** has been endowed by the family of the late Chief Justice Walter Clark of North Carolina, namely, Mrs. J. E. Erwin, David Clark, William A. Graham Clark, John W. Clark, Thorne Clark, Mrs. John Allan MacLean, and Mrs. Walter Clark, Jr.
4. **"The Chemical Engineering Fund"** has been established by contributions from individuals and corporations connected with the pulp and paper industry of North Carolina for the purpose of supplementing State salary schedules in this department.
5. **"The Construction Engineering Fund"** has been set up by the Carolinas' Branch of the Associated General Contractors for the purpose of supplementing salaries of faculty members in the School of Engineering who teach subjects in Construction Engineering.
6. **"The Electrical Contractors' Professorship in Electrical Engineering"** is endowed by a fund sponsored by the North Carolina Electrical Contractors' Association.

The North Carolina Textile Foundation was formed to promote the development of the School of Textiles. It was incorporated on December 31, 1942, and funds for this Foundation have been raised largely from textile manufacturing plants and other corporations and industries closely allied to textiles. This Foundation has had remarkable success, and its assets are now $989,000. As a result of the work of this Foundation, the School of Textiles at North Carolina State College is considered by many as the most outstanding Textile School in the world.

Special Textile Foundation Funds

1. **"The Burlington Mills Endowed Professorship of Research in Synthetic Fibers."** Burlington Mills, Inc., of Greensboro, has contributed shares of its common stock, with a market value of approximately $70,000, to the North Carolina Textile Foundation as an endowment for the creation of a teaching and research professorship in synthetic fibers.
2. **"The Benjamin B. Gossett Lectures on Textiles."** The Benjamin B. Gossett lectures on textiles were made possible by a gift of $10,000 in 1946 by Doctor Benjamin B. Gossett, a leading textile manufacturer of Charlotte, North Carolina. Each year during the next few years the leading textile executives, economists, and scientists of America will be brought to the College in the Gossett Lectures series.

STUDENT ACTIVITIES

Campus Government and Honor System

Upon matriculation at the North Carolina State College the student becomes a member of the community and fellowship that is State College. As a member of this great fellowship and as a citizen of the campus community, each and every student is responsible, in both the legal and moral sense, for the effective ordering of his personal life in the interest of the common good.

The new Constitution and By-Laws establishing the Campus Government and Honor System of the North Carolina State College were adopted in May 1945, after a year of intensive work and study by a joint student and faculty committee.

The Campus Government and Honor System of the North Carolina State College was conceived in creative cooperation and is dedicated to the full and free assumption of joint responsibility by the student body and the faculty for the furtherance of the present and future effectiveness of State College. Four faculty members hold elective seats on the Campus Government Council along with twenty-four students. This body has full legislative, executive and judicial authority within the framework of the Campus Government Constitution and the legal entity that is the North Carolina State College of Agriculture and Engineering of the University of North Carolina.

Since practical experience with government and democratic living is an indispensable supplementation of academic training, the Campus Government and Honor System of the North Carolina State College is a capstone extra-curricular activity that offers every student challenging opportunity for personal development and worthful service to the college.

Student Publications

The Publications Board is composed of the editors and business managers of all student publications, the president and the past president of the junior class, the president of the Student Council, and five faculty members. The Board seeks to promote the interests of the College and of the publications, to insure cooperation among the publications, and to hold the loyal support of the faculty, the students, and the public.

The Technician, the student newspaper, is delivered to each student's mail box every Friday morning of the regular College session. The charge for the paper is included in the student's publications fee.

The Agromeck is the official annual published at the end of each scholastic year of the College. A copy of **The Agromeck** is also paid for by each student in his publications fee.

The Agriculturist, a monthly magazine in its field, was begun by the activities of the Alpha Zeta fraternity and the "Ag" Club. All students of the School of Agriculture and Forestry are concerned in this enterprise.

The Southern Engineer, the organ of the School of Engineering, is managed by the Board of Directors of the Southern Engineer. They plan to issue four numbers during the regular College session.

Pi-ne-tum is the annual of the Division of Forestry. Its contents constitute a record of persons, especially the graduating class, and of events of the year interesting to students of the Division and their friends.

The Textile Forum is published quarterly by the students in the Textile School.

The Wataugan is a humor magazine published monthly.

Clubs and Societies

All clubs and societies endeavor to bring together students (some clubs include members of the faculty), with the same interests or professional objective, in order to cultivate close personal relations and fellowship. Their chief purpose is to inculcate high professional consciousness and *esprit de corps*. With a view toward the accomplishment of these ends, they afford to members an opportunity to hear and to participate in discussions of professional problems, to prepare and to present papers on current technical topics.

The Agricultural Club, besides the usual activities, sponsors an annual Ag Fair, Livestock Day, picnic, and dance.

The Forestry Club, having the usual program through the year, publishes its own annual, *Pi-ne-tum* (described under "Student Publications," above).

La Société des Beaux Arts includes students in Architectural Engineering and those in Landscape Architecture.

The Agricultural Engineering Club is a student branch of the national organization, The American Society of Agricultural Engineers, and brings together students of this department to discuss all phases of their specialty.

The Collegiate Chapter of the Future Farmers of America devotes its attention to matters of interest to students who are preparing to become teachers of agriculture.

Agronomy Society
Animal Industry Club
Aquinas Club
Baptist Student Union
Cadet Officers' Association
Canterbury Club
Chess Club
Hillel Club
Horticulture Club
International Relations Club
Leopold Wildlife Society
Lutheran Student Association
Masonic Club
Rockhound Society
State College Charlotte Club
The Industrial Arts Club
Veterans Association
Wesley Foundation

Student Chapters in Engineering at State College represent the following national organizations:

The American Ceramic Society
The American Institute of Chemical Engineers
The American Institute of Electrical Engineers
The American Institute of Mining and Metallurgical Engineers
The American Society of Civil Engineers
The American Society of Mechanical Engineers
The Associated General Contractors of America
The Institute of Aeronautical Sciences
The Institute of Radio Engineers
The National Society for the Advancement of Management
The Society of Industrial Engineers
Theta Tau, Rho Chapter (National Professional Engineering Fraternity).

The Engineers' Council, composed of three students and a professor from each Department of the School of Engineering, publishes quarterly *The Southern Engineer.*

The Tompkins Textile Society endeavors to keep abreast of whatever affects the textile industry, state, national, or foreign.

The Monogram Club has as its purpose to develop the highest order of sportsmanship in all athletics.

Honor Fraternities and Societies

Honor Fraternities and Societies strive to encourage and reward high attainment in scholarship and character, and to instill lofty professional ideals, with leadership in contribution to existing knowledge and in service as prime objectives. The following national fraternities and societies have chapters or other organizations at State College:

Alpha Zeta: Agricultural
Alpha Kappa Delta
Eta Kappa Nu: Electrical Engineering
Gamma Sigma Epsilon: Chemical
Kappa Phi Kappa: Teaching
Keramos: Ceramic Engineering
Lambda Gamma Delta: Agricultural Judging
Mu Beta Psi: Musical
Phi Eta Sigma: Freshman, Scholarship
Phi Kappa Phi: Scholarship
Phi Psi: Textile
Pi Kappa Delta: Public Speaking
Pi Tau Sigma: Mechanical Engineering
Scabbard and Blade
Sigma Pi Alpha: Language

Tau Beta Pi: Engineering
Blue Key: Scholarship, Leadership, Student Activities
Xi Sigma Pi: Forestry, Honorary.

The following are organizations peculiar to State College:

The Golden Chain: Senior Citizenship
The Order of St. Patrick: Senior Engineering; Collegiate and Personal Distinction
The Order of 30 and 3: Sophomore Leadership
The Pine Burr Society: Scholarship and Extracurricular Activity
Sigma Tau Sigma: Textile, Scholarship

Social Fraternities

Following are the national Greek-Letter Fraternities having chapters at State College.

Alpha Gamma Rho
Alpha Sigma Phi
Delta Sigma Phi
Kappa Alpha
Kappa Sigma
Lambda Chi Alpha
Phi Kappa Tau
Phi Epsilon Tau (Local)
Pi Kappa Alpha
Pi Kappa Phi
Sigma Alpha Epsilon
Sigma Alpha Mu
Sigma Nu
Sigma Phi Epsilon
Sigma Pi
Sigma Chi
Tau Kappa Epsilon

The Interfraternity Council, composed of two representatives from each chapter, has as its purposes to advance the interests of North Carolina State College; to promote the general interests and welfare of the associated fraternities as a body; and to insure cooperation between them in their relations with the faculty, the student body, and the public in general.

MEDALS AND PRIZES*

1. **The Alpha Zeta Cup** is awarded to the sophomore in Agriculture who during his freshman year made the highest scholastic average.

2. **The General Alumni Association of the College** presents annually a trophy to the student who during the College year has most distinguished himself in athletics.

3. **The American Institute of Chemical Engineers** presents annually its award to the sophomore who during his freshman year made the highest scholastic record.

4. **The Associated General Contractors of America Prize** is awarded each year by the Carolina Branch of this organization to the member of the graduating class in Construction Engineering who during his sophomore, junior, and senior years has made the highest scholastic record.

* Several of the above medals and prizes have been discontinued temporarily but it is expected that they will be resumed this year.

5. **The Elder P. D. Gold Citizenship Medal,** founded by the late C. W. Gold in memory of his father, and continued by his son, C. W. Gold, Jr., of Greensboro, North Carolina, is awarded annually to the member of the graduating class who during his sophomore, junior, and senior years has most distinguished himself in Student Citizenship. The qualities determining the award—scholarship, student leadership, athletics, and public speaking—are to be attested by the College Registrar, the Student Council, the Faculty Athletic Committee, and a committee composed of the Dean of Administration and Dean of Students.

6. **The Moland-Drysdale Corporation Scholarship Cup,** presented by Mr. George N. Moland, of Hendersonville, North Carolina, President of the Corporation, is awarded annually to the freshman in Ceramic Engineering who, during the two terms preceding Scholarship Day, has the highest scholastic record together with interest shown in the activities of the Department.

7. **The J. C. Steele Scholarship Cup,** presented by J. C. Steele and Sons, of Statesville, North Carolina, to commemorate the establishment by Mr. Steele of the first plant for the manufacture in the South of ceramic machinery, is awarded annually to the student of the three upper classes in the Department of Ceramic Engineering who has made during the three terms preceding Scholarship Day the highest scholastic record. In making the award, personality and interest in the activities of the Department are considered.

8. **The Sigma Tau Sigma Cup** is awarded annually to the senior in Textiles who has the highest scholastic record.

9. **The Textile Colorist Medal** is awarded annually to the senior who presents the best thesis on some subject in Textile Chemistry and Dyeing.

10. **The National Association of Textile Manufacturers Medal** is awarded annually to a senior in the State College Textile School. The award is based upon conditions outlined by the National Association.

11. **Phi Kappa Phi, Honarary Scholarship Society,** awards each year a gold medal to the senior who as a junior, a silver medal to the junior who as a sophomore, and a bronze medal to the sophomore who as a freshman, made respectively, the highest scholastic record.

12. **The Mu Beta Psi Cup** is awarded annually to the senior having rendered the most service to the State College musical organizations during his college career.

Physical Education and Intramural Athletics

Professor J. F. Miller, Head

Assistant Professor T. I. Hines	Instructor E. R. DeGroat
Assistant Professor C. G. Doak	Secretary Mrs. C. A. Northcutt
Instructor W. E. Smith	Custodian Harold H. Haynes

Aims.—In general, the Department aims are: (a) to promote a higher standard of physical fitness through "big muscle" activities; (b) to develop habits, knowledge, appreciation, and skills in desirable sports, and athletic and gymnastic procedures; (c) to develop habits of safe recreative activities to continue after graduation.

Organization: The Department of Physical Education and Intramural Athletics is in the Basic Division of the College. The program of service has two sections: Physical Education, offered in various curricula, for which college credit is given; Intramural Athletics, for every interested student in the College.

Control: All activities of the Department are controlled by the College. and are under the supervision of the Dean of the Basic Division. The Head of the Department seeks balance and coordination in the work of the two sections. He delegates the work of the staff and sees that policies of the Department are carried out by them. The members of the staff are expected to give reasonable and capable assistance in any work of the Department. They are responsible to the Head of the Department for carrying out their duties.

Buildings and Fields: The Department of Physical Education and Intramural Athletics is quartered in the Frank Thompson Gymnasium. An attractive feature of the gymnasium is a white-tiled swimming pool with modern filter and chlorinating systems. Doak Field adjacent to the Gymnasium is used for physical training classes and intramural activities. The track field is used for physical training classes. The College has ten excellent clay tennis courts, with additional courts contemplated.

Physical Education Activities: The College requires all students to enroll in some type of physical activity for two years, or six full terms. The classes meet twice a week, one term credit being given for each term's work. All students are required to take a physical and a medical examination at registration and a physical fitness test. Those who are subnormal in any way are placed on a recall list. Students may receive free medical advice at any time. All freshmen are required to take the course in Health Education which meets once a week for one term. Instruction in personal hygiene is given by members of the Physical Education Staff. A swimming requirement is also made for all freshmen. This requirement must be met before graduation.

The required physical training courses are so standardized that they are presented, instruction is given, and examination is required of each student on the same basis as all other college courses.

All students are required to take classification activities of an individual nature during their first term. At the close of the fall term and examination is given which, together with their physical fitness test and medical examination, determines the future activities of the student. The better group of students will be permitted to elect controlled sports throughout the remainder of their physical education requirements. The normal group will remain in the fundamental activity program until such time as they qualify to enter the elective sports activity program. A restrictive group comprised of those students who have physical defects of a permanent nature will be given selected activities. In general, the physical training activities fall into one of three groups: (a) Those developing physical skills and conditioning, (b) Those occupying recreative or leisure time, (c) Those of a restrictive and corrective nature.

Intramural Activities: Activities are fostered and prompted in many lines of athletic sports for the student body. Meets, tournaments, and leagues are seasonably organized in twelve separate sports. Participation in these sports activities is purely voluntary; it does not receive college credit. Sports used in this program are correlated with those used in the required class work in Physical Education. Instruction in the sports is given in the class work, and opportunity for competition is provided in the intramural program. Cups, shields, and trophies are awarded winners in these competitions.

INTERCOLLEGIATE ATHLETICS

J. L. VonGlahn, Director

Beattie Feathers, Head Football Coach
Everett Case, Head Basketball Coach
Victor Sorrell, Head Baseball Coach
Thomas I. Hines, Head Track Coach
Willis Casey, Head Swimming Coach
Walter Seegars, Head Tennis Coach
Robert Suffridge, Assistant Football Coach
Walter Wood, Assistant Football Coach
Lyle Rich, Assistant Football Coach
Al Crawford, Head Wrestling Coach and Athletic Trainer
Carl Anderson, Assistant Football and Basketball Coach
Sax Barnes, Custodian Athletic Supplies
Mrs. Denise Bullard, Secretary Athletic Dept.

North Carolina State College is a member of the Southern Conference and subscribes to its rules of eligibility for all intercollegiate contests. The program consists of the organization and training of representative varsity and freshman teams in the following sports: football, basketball, baseball, track, cross-country, wrestling, swimming, tennis, golf, and rifle competition.

Intercollegiate Athletics is a separate department of the college. Its policies are determined by the Athletic Council, and carried out under the supervision of the Director of Athletics. All activities of the Department are controlled by the College.

MUSIC

Christian D. Kutschinski, Director

Students with previous musical experience are encouraged to continue such activities in campus musical organizations for which they can qualify. They may enroll in the R. O. T. C. Band for their required military drill.

The 80-piece **R. O. T. C. Band** and 50-piece **Drum-and-Bugle Corps** furnish martial music for all military parades by the R. O. T. C. Regiment. Their R. O. T. C. drill periods are devoted to both military and musical instruction.

The 90-piece **Red-Coat Band** plays and marches at football games, and at other campus and civic affairs. Its membership comprises select R. O. T. C. and non-R. O. T. C. bandsmen, who rehearse three hours a week independently of the R. O. T. C. Band.

At the conclusion of the football season the personnel is reduced to a 72-piece symphonic or concert band.

The band is also subdivided into smaller units which alternate in furnishing music at pep meetings, basketball games, and on other such occasions.

The **Concert Band,** composed of 72 of the most proficient musicians on the campus, concentrates on the study and performance of the finest in concert music. Its activities have greatly increased the cultural growth of those participating, and have done much toward increasing appreciation of music on the campus and in the community, in addition to providing wholesome entertainment.

The **R.O.T.C. Drum-and-Bugle Corps,** besides functioning as a separate unit, is also combined with the band on certain occasions, giving State College a marching musical unit of 140 men in red-and-white uniforms. The band uniforms were contributed by students and faculty and interested citizens of Raleigh through the efforts of The American Legion and the Junior Chamber of Commerce.

Credit.—Juniors and seniors in the Redcoat band, may obtain three term credits per year for Band when approved by the Director.

The **Concert Orchestra** is augmented by a number of the best musicians in Raleigh to round out a symphonic instrumentation. Besides preparing concert programs, the orchestra is divided into smaller units to provide music of a lighter nature for numerous College functions.

The **Men's Glee Club** rehearses three times a week, and alternates with the orchestra and bands in giving concerts throughout the year. It has proved to be a very popular extracurricular activity, and the group is in demand for broadcasts, and for concerts out of town and at civic functions, in addition to those on the campus.

A **Male Quartet** and small **Chamber Music** ensembles are encouraged.

COLLEGE PUBLICATIONS

The State College Record is the official publication of State College and is issued from time to time, giving results of special studies and of research by members of the college faculty. The March issue is the annual CATALOG with announcements for the following year. Announcements as to College Extension courses also are included in *The Record* series as is found necessary.

Technical and popular bulletins are issued by the Agricultural Experiment Station as research projects are completed or as they have progressed far enough to be of definite value. *Research and Farming* also is a quarterly publication of the Experiment Station. Both the bulletins of the Station and the quarterly publication will be sent free to citizens of the State on request.

General publications, many of them interpreting the scientific findings of the Experiment Station or giving results of Extension demonstration, are compiled by members of the Agricultural Extension Staff and are printed as circulars, folders and pamphlets. Usually they are brief, written in simple style and designed for popular use. *The Extension Farm-News*, published monthly, is the official house organ of the Extension Service. All of these publications also are available free to citizens of the State on request.

The College publishes the results of experimental and research projects by its Engineering Experiment Station and by the Textile and Enginering Schools. Information about these publications may be obtained from the Director of the Engineering Experiment Station or from the Dean of the School of Textiles.

HEALTH OF STUDENTS

The authorities of the College strive to protect the health of the students in every way. The college medical examination blank should be completed by the family physician. If remedial defects are discovered, such as defective tonsils or eyes, he should be advised to have the defect corrected. Physically handicapped students are placed in a special class under the supervision of the Director in the Physical Education Department of the College.

The infirmary, maintained by the College, has accommodations for 76 patients. There is a staff of nine: the College Physician, a Supervising Nurse, a Night Supervisor, five general duty nurses, and one full-time Laboratory and X-Ray Technician.

A modernly equipped First-Aid Department, and a Laboratory and X-Ray Department are valuable features of the Infirmary.

The College Physician visits the Infirmary regularly once daily and more often when necessary. The Infirmary is never closed. A graduate nurse is on duty day and night. Students have free access to the Infirmary at all times.

Parents or guardians will be notified immediately by the Dean of Students in case of accident or serious illness of their sons, and no surgical operation will be performed, except in cases of extreme emergency, without full consent of parents.

The medical fee provides for students' infirmary service, general medical treatment, and the services of nurses. It does not provide for surgical operations, outside hospital care, or the services of dentists or any other specialist.

THE GENERAL ALUMNI ASSOCIATION

H. W. Taylor, Executive Director

Purpose.—The purposes of this organization are: to promote the growth, progress, and general welfare of State College; to foster among its former students a sentiment of regard for one another and continuing attachment to their Alma Mater; and, to interest prospective students in attending State College.

Membership.—Student Associate membership is available to every student for the nominal sum of $2.00, which covers membership for 12 months from date of payment and also includes subscription to State College News.

Active membership is available to all former students, regardless of length of stay at the college. The annual dues for active members is $3.00, which covers membership for 12 months from date of payment and also includes subscription to State College News.

Associate membership includes those members of the College Faculty, Staff, Extension Service, Teachers of Agriculture in high schools, Experiment Station workers, and others who are elected to such membership by the Association. The annual dues are $2.00 and include subscription to State College News.

Honorary members include such distinguished persons as are duly elected to honorary membership at the commencement meeting of the association.

Meetings.—The Association meets annually on Alumni Day in connection with commencement exercises.

Reunions.—Class reunions are held each year in connection with the annual meeting of the Association. They are scheduled so that each class has a reunion the first year, and subsequently, every five years after graduation.

Elections.—Officers of the association are elected by the active members between April 1 and May 15 each year. Ballots are printed in State College News.

State College Clubs.—Local clubs are organized in most of the counties in North Carolina and in a number of cities in other states, such as New York, Chicago, Pittsburgh, Washington, Norfolk, Richmond, Newport News, Knoxville, Chattanooga, Kingsport, Columbia, Spartanburg, Greenville, Jacksonville, and Atlanta. Most of them hold quarterly meetings and student associate members are invited to attend.

State College News.—State College News is published every month in the year by the General Alumni Association and is sent to all dues paying members. The purpose of this magazine is to keep Association members in touch with the college and with each other. It carries news about former and present students and about the college, and is well illustrated with pictures.

The Alumni Office.—Records of both graduates and nongraduates are kept by the Alumni Office. The master file includes information on all former students; other files are arranged geographically and by classes. Biographical files are also kept.

Serving as a medium of communication between alumni and the College, the Alumni Offices, located in the Old Infirmary Building, are official headquarters for alumni when they visit the campus.

THE D. H. HILL LIBRARY

Harlan Craig Brown, Librarian
A.B., B.S. in L.S., University of Minnesota; A.M. in L.S., University of Michigan

Mrs. Reba Davis Clevenger, Assistant Librarian
B.L.S., University of Illinois

Mrs. Katherine Alston Edsall, Circulation Librarian
A.B., Randolph-Macon Woman's College; A.M., Columbia University; B.S. in L.S., Catholic University of America.

Miss Foy Lineberry, Catalog Librarian
A.B., Meredith College; B.S. in L.S., University of North Carolina.

Mrs. Evelyn B. Noblin, Assistant Catalog Librarian
B.A., Chowan College; A.B., University of North Carolina; A.B. in L.S., University of North Carolina.

Miss Mary Elizabeth Poole, Reference and Document Librarian
A.B., Duke University; B.S. in L.S., University of North Carolina.

Miss Anne Leach Turner, Order Librarian
A.B., University of North Carolina; B.S. in L.S., Columbia University.

Miss Mary Ellen Senter, Assistant in Circulation Department
A.B., Meredith College.

Miss Melba Ellen, Assistant in Circulation Department

Mrs. Naioma Tarleton, Assistant in Circulation Department
A.B., Eastern Carolina Teachers' College.

Mrs. Mildred S. Vick, Assistant in Circulation Department

Mrs. Alice Ninon Crowson, Assistant in Catalog Department

Mrs. Elizabeth Rogers, Assistant in Periodicals Department

Mrs. Frances S. Gaines, Secretary and Stenographer

DEPARTMENTS

Miss Katherine McDiarmid, Librarian, School of Textiles Library
B.A., Goucher College; B.S. in L.S., Columbia University.

Mrs. Harrye Lyons, Librarian, Architecture Department Library
B.A., University of Iowa.

The D. H. Hill Library building was erected in 1926, and named in honor of a former president of North Carolina State College. It houses the main part of the book collection and provides reading rooms for study and reference.

This is a reference and circulating library open to all the college personnel. There is no limit to the number of books that may be borrowed at one time. Its resources are available, through interlibrary loan, to individuals and to other educational institutions of the city and state.

The library comprises over 85,000 volumes of books and journals, 9,500 volumes of bound federal, state and foreign documents, and a large number of unbound items. More than 1,150 periodicals and newspapers are received currently. The library's holdings are particularly well developed in the special fields of science and technology, which are covered in the curriculum and which are followed in the research programs of the graduate school and the Agricultural Experiment Station and the Engineering Experiment Station. In addition, the library offers recreational and general informational reading.

An Architecture Department Library, located in Daniels Hall, was established in 1941. The nucleus was a gift from the personal library of Professor Ross Shumaker and the collection now consists of more than 2,500 volumes of books, journals, bibliographical materials and reference aids.

In 1945, there was established a department library in the School of Textiles. It contains over 1100 bound volumes of books and journals and a large collection of pamphlet material. It serves not only the student body but also the research staff, as it is well equipped with abstracting and bibliographical tools.

YOUNG MEN'S CHRISTIAN ASSOCIATION

Board of Directors

M. E. GARDNER, *Chairman*
W. G. VAN NOTE, *Vice-Chairman*

E. L. Cloyd
David A. Worth
L. L. Vaughan
John A. Park
T. C. Brown
J. M. Clarkson
F. B. Wheeler
A. D. Stuart
B. F. Brown
Ralph W. Cummings
W. N. Hicks
Thomas Nelson

Employed Staff

EDWARD S. KING, General Secretary
N. B. WATTS, Associate Secretary
MRS. L. W. BISHOP, Office Secretary

Student Organization

The Student Cabinet

The cabinet is composed of the four officers of the association, President, Vice-President, Secretary, and Treasurer and the chairmen of all standing committees. The officers are elected annually by ballot. The committee chairmen are appointed by the President. The cabinet is in charge of the program of the association. The President and Treasurer are ex-officio members of the Board of Directors.

The objective of the Young Men's Christian Association is to help contribute whatever is lacking in the total educational situation to make the principles and the spirit of the Christian religion effective in personal life and in all social relations.

The Y. M. C. A. Building is the social and religious center of the campus. On the basement floor are a recreation room, a guest room, and the Student Supply Store. There is a spacious lobby, an auditorium, a reception room, office of the assistant secretary, and the service office on the first floor. The second floor provides space for the Faculty Club, a Conference Room, a committee room, the Y.M.C.A. Cabinet Room, and the office of the Associate Secretary and the General Secretary.

The student-employment service is directed by the Associate Secretary of the Association.

Student and faculty organizations of all kinds use the facilities of the building for meetings and social gatherings, entertainments and lectures.

The Y. M. C. A. program, directed by the Student Cabinet, includes, with other features not mentioned, work for new students; organizing a Freshman Cabinet; planning socials with the students from nearby women's colleges; bringing to the campus eminent men to speak on such topics as men-and-women relations, and present-day international, racial, and economic questions; conducting an annual religious-emphasis week under the leadership of Christian ministers or laymen who understand student life; sending delegates to State, regional, and National Christian Student Conferences.

MILITARY TRAINING

The Military Department: The Reserve Officers Training Corps

The Reserve Officers Training Corps (ROTC) is the designation of the military organization at State College. The mission of the ROTC is to produce junior officers who have the qualities and attributes essential to their progressive and continued development as officers of the Army of the United States.

The ROTC training consists of two courses of two years each.

The Basic Course.*—The Basic Course is required for all physically fit male freshmen and sophomores. This course consists of training common to all branches of the Army and the Air Forces.

The Advanced Course.—Entrance into the advanced course is elective and is open to selected juniors who have successfully completed the basic course and to selected veterans who have had a year or more of active service in the Armed Forces and who have not less than two complete college years remaining before graduation. The course is of a specialized type de-

* All veterans in service as long as six months are excused from this course.

signed to qualify selected students for reserve commissions in one of several arms or services of the Army or the Air Forces. Students enrolled in the advanced course are required to execute a written agreement with the Government to complete the advanced course, contingent upon remaining in school; and to attend the advanced summer camp at the time specified.

More detailed description of courses is given under "Military Science and Tactics"—Section IV of the Catalog.

Miiltary Band and Drum & Bugle Corps.—A Military Band and Drum & Bugle Corps are component parts of the ROTC and are trained by the Director of Music of the College. Instruments are provided by the Federal Government. Membership is open to all ROTC students who can qualify.

Instructors.—The Federal Government details officers of the Army as Instructors in the ROTC. The senior instructor at the College is designated by the War Department as Professor of Military Science and Tactics. The senior Air Forces Instructor is designated as Assistant Professor of Air Science and Tactics. Regular Army and/or officers of the Army of the United States on active duty conduct class room instruction and supervise the instruction of the ROTC on the drill field.

Uniforms and Equipment.—An officers' type uniform for both basic and advanced course students and all instructional equipment are provided by the Federal Government. These are issued to the institution, which is accountable to the Federal Government for their proper care and use.

Financial Aid.—Students enrolled in the advanced course are paid a monetary allowance in lieu of subsistence at the daily rate equal to the value of the commuted ration (about 79c) for a total period not to exceed 570 days during the two years of the course. Students in the basic course receive no monetary allowance.

Credit.—Credit is allowed for work at other institutions having a ROTC Unit established in accordance with the provisions of the National Defense Act and Army Regulations governing the ROTC. Record of a student's prior training in ROTC is obtained by the Military Department from the institution concerned.

Educational Value of the ROTC.—The Army and Air Forces as recently reorganized to meet Post War requirements places greater stress on educational values than ever before. This is reflected in the new ROTC courses of instruction in which leadership, personnel management, exercise of command, tactical employment of the combined arms, and military policies and problems of the United States are stressed. The course not only prepares students for officers in the Reserve Corps but awakens in them an appreciation of the obligations of citizenship, and secures for them personal benefits of organization, discipline, and leadership, and are given practical instruction in their application.

Distinguished Military Students.—Each year the college is authorized to designate outstanding graduates of the ROTC as Distinguished Military Students. Those so designated may, upon graduation from college, be designated Distinguished Military Graduates and be selected for commission in the regular Army or Air Forces of the U. S. provided they wish to avail themselves of this opportunity.

III. SCHOOLS, DIVISIONS AND DEPARTMENTS

THE BASIC DIVISION

*Benjamin Franklin Brown, Dean

Organization.—Upon recommendation by President Graham, the Basic Division of the College was created by action of the Board of Trustees at its annual meeting on June 11, 1935. After considerable preliminary preparation, the organization of the Division became effective July 1, 1937, the first students being registered in the Division in September, 1938. For the first year it seemed advisable to include only the incoming freshmen. Beginning with the College year 1939-40, all freshmen and sophomores in the College are registered in the Basic Division.

Within its administration, the Basic Division includes the Departments of Economics, English, Ethics and Religion, History and Political Science, Modern Languages, Physical Education, Social Studies, Sociology, and Student Personnel. The Heads of the Departments, or representatives from them, constituting the **Administrative** Board of the Division, together with the members of the several Departments are as follows:

Economics

Professor R. O. Moen, Head of the Department
Professors B. F. Brown, C. B. Shulenberger, M. C. Leager, T. W. Wood
Associate Professors P. F. Brookens, Rudolf E. Freund, J. A. Lyons, George T. O'Neill
Assistant Professors W. E. Roberts, F. E. McVay, E. C. Collins
Instructors R. S. Berberich, L. C. Larkin, Wm. F. E. Long, V. A. Pikner, O. G. Thompson

English

Professor Lodwick Hartley, Head of the Department

Professors J. D. Clark, A. M. Fountain, A. I. Ladu, R. P. Marshall; Visiting Professor Mrs. S. J. Harmon; Associate Professor E. H. Paget; Assistant Professors P. H. Davis, H. G. Kincheloe, J. D. Rulfs, A. B. R. Shelley, L. H. Swain, R. G. Walser, T. L. Wilson, W. K. Wynn, R. B. Wynne; Instructors Mrs. R. C. Allen, I. L. Baker, Mrs. L. K. Cell, Miss E. L. Cox, C. R. Craven, Mrs. P. F. Craven, M. B. Dickinson, Mrs. L. Dickinson, H. A. Doak, Mrs. M. E. Doak, Mrs. A. B. Engman, Mrs. D. P. Greenwood, Miss H. C. Griffin, Mrs. S. Howell, Mrs. N. B. Leitch, Mrs. Charlotte Litwack, Miss M. M. Penny, J. A. Shackford, Miss D. R. Sharpe, Miss M. J. Spruill, Mrs. H. B. Turner, Mrs. A. K. Wallace, L. R. Whichard.

Ethics and Religion

Professor W. N. Hicks, Head of the Department

* Resigned April 1, 1948.

History and Political Science

Professor James W. Patton, Head of the Department

Professor P. W. Edsall; Associate Professors L. W. Barnhardt, L. W. Seegers; Assistant Professors Stuart Noblin, K. D. Raab; Instructors Rex Beach, C. M. Brown, C. F. Kolb.

Modern Languages

Professor L. E. Hinkle, Head of the Department

Associate Professor S. T. Ballenger; Assistant Professor Mrs. Ruth B. Hall; Instructors Fred J. Allred, Imogene Riddick

Physical Education and Intramurals

Professor J. F. Miller, Head of the Department
Assistant Professors C. G. Doak, T. I. Hines
Instructors, Eric B. DeGroat, Wm. E. Smith

Social Studies

Professor George A. Gullette, Head of the Department

Instructors Herbert Collins, Carlton C. Jenkins, John Kingsbury, Wade Marr, Jr., Burton M. Sapin, Richard C. Sterne, I. Webb Surratt.

This department is responsible for the course in Contemporary Civilization required of all engineering freshmen.

Sociology

Professor Sanford R. Winston, Head of the Department
Teaching Fellow, Frank A. Santopolo

Student Personnel

Professor R. N. Anderson, Director
Assistant Professor L. B. Rogers, Assistant Director

The Student Personnel Program has as its main purposes:

(1) to aid students in orienting themselves to their new college environment and

(2) to provide a source of individual help for all students as adjustment problems arise.

Freshman Week is designed: to help the new student feel welcome to the institution; to acquaint the student with the objectives, rules and regulations, and the campus and living accommodations of the College; to provide an opportunity for obtaining from the students, by means of tests and other procedures, information which will aid in the placement and guidance of the students; to establish definite relations between students and counselors for later guidance; and to perform the details of admission.

The Faculty of the Division

The faculty is composed of the staff members of the Departments named above and, in addition, the teachers of freshmen and sophomores from the

Departments of Botany, Chemistry, Geology, Mathematics, Physics, Psychology, and Zoölogy.

Purposes.—Broadly speaking, the purposes of the Basic Division are (a) to provide the best possible preliminary training during the first two years of the student's college career so that he can during the last two years successfully pursue his professional education in agriculture and forestry, engineering, textiles, or vocational education; and (b) to provide effective guidance during the first two years, so that those students with well-chosen and fixed purposes can be well-advised in their educational careers, and also so that those students who have made an unsatisfactory choice of curriculum or who have become uncertain of their careers, may receive helpful guidance and advice in finding themselves.

More specifically it is the function of the Basic Division:

First, to provide "two years of basic courses in the humanities, natural and exact sciences, and the social sciences as the foundation of the schools of agriculture and forestry, textiles, and engineering;"[1]

Second, "to provide in the curricula of the upper years of each technological school for a minimum of the more general cultural courses in the humanities, natural sciences, and social sciences."[2]

Promotion.—A student is promoted from the Basic Division upon earning with an average grade of at least C not fewer than 105 credits, including all of the work prescribed in his freshman year.

Those promoted may procure Certificates of Promotion upon application to the Dean of the Basic Division.

Student Loads.—It is the policy of the Basic Division and the purpose of its scholarship rules to encourage students to take such a number of credit hours each term as they can carry well, depending upon previous preparation, ability, self-help duties, health, etc. With few exceptions, each student starts the first term of his first year with a normal average load; those who do exceptionally well are encouraged to make as good progress as possible by adding hours up to their capacity, while those whose records indicate lack of ability from any cause are urged to reduce their loads to a point where they can do work of a creditable quality. Judgment as to the load that a student should take in any term is based upon previous demonstration of scholarship.

PROGRAMS OF STUDY

Programs of Study.—The Basic Division grants no degrees. It provides two years of fundamental training in preparation for the special training of the last two years in the other divisions of the College:

The School of Agriculture and Forestry
The School of Engineering
The Division of Teacher Education
The School of Textiles

Its programs of study are as follows:

[1] President Graham's Report to the Board of Trustees, June 11, 1935, page 11.
[2] Ibid.

AGRICULTURE AND FORESTRY

A. General Curriculum in Agriculture

†Majors in:

Any department except Agricultural Engineering, Chemistry, Experimental Statistics and Forestry.

Courses	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Alg., Trig., and Phys. Geol., Math. 111, 112, Geol. 120	4	4	4
U. S. Hist., and Am. Govt., Hist. 121, 122, Pol. Sc. 211	3	3	3
Gen. Bot., or Gen. Zool., Bot. 101, 102 or Zool. 101, 102	0	4	4
Gen. Field Crops or Int. to An. Ind., F.C. 101 or A.I. 101	4	0	0
Int. to An. Ind., or Gen. Field Crops, A.I. 101 or F.C. 101	0	4	0
Gen. Hort. or Gen. Poult., Hort. 101 or Poul. 101	0	0	4
Int. to Ag., Ag. 101	1	0	0
†Mil. Sc. I, Mil. 101, 102, 103	2	2	2
Physical Education and Hyg. P.E. 101, 102, 103	1	1	1
Gen. and Org. Chem., Chem. 201, 202, 203	5	5	5*
Gen. Zool. or Gen. Bot., and Physics, Zool. 101, 102, or Bot. 101, 102 and Phys. 115	4	4	5*
Gen. Poul., or Gen. Hort., Poul. 101 or Hort. 101	4	0	0
Rur. Soc., or Ag. Econ., Rur. Soc. 201, Ag. Econ. 202	3	0	0
Ag. Econ. or Rur. Soc., Ag. Econ. 202, Rur. Soc. 201	0	3	0
Pub. Spk., Eng. 231	0	0	3
Farm Equip., or Soils, Ag. Eng. 202 or Soils 202	0	4 or 5	0
Soils or Farm Equip., Soils 202 or Ag. Eng. 202	0	0	4 or 5*
†Mil. Sc. II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1

† Or six credits in one or two of the following deartments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

* Majors will be chosen at the end of the fifth term. Students anticipating the desire to take a full year of Organic Chemistry, or a full year of Physics, may omit either or both of these five-hour courses and schedule courses from the upper two years. Soils or Agricultural Engineering may be postponed to the upper two years if the major selected makes some other course nonessential at this point.

B. Specialized Curriculum in Agriculture

Majors in:

Experimental Statistics or any other department in the School of Agriculture.

	F	W	S
Composition, Eng. 101, 102, 103	3	3	3
†Gen. Chem. and Qual. Anal., Chem. 101, 102, 103	4	4	4
Alg., Trig., Anal., Math. 101, 102, 103	4	4	6
U. S. Hist., and Am. Govt., Hist. 121, 122, Pol. Sc. 211	3	3	3
Int. to Ag., Ag. 101	1	0	0
*Mil. Sc. I, Mil. 101, 102, 103	2	2	2
Physical Education and Hyg. P.E. 101, 102, 103	1	1	1
Phys. for Eng. Phys. 201, 202, 203 or Chemistry elective	5 or 4	5 or 4	5 or 4
Gen. Bot., or Gen. Zool., and Phy. Geol., Bot. 101, 102 or Gen. Zool. 101, 102, and Geol. 120	4	4	4
Pub. Spk., Eng. 231, and Elective English	3	3	3
††Electives	6 or 7	6 or 7	6 or 7
*Mil. Sc. II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

† Students who do not anticipate taking more than one year of Chemistry will take Chem. 201, 202, 203.

†† A minimum of 18 hours of technical agriculture must be taken among electives of the second, third and fourth years. A minimum of 240 credits is required for graduation.

Major in Agricultural Engineering

Courses	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Gen. Inorg. Chem., Chem. 201, 202, and Phys. Geol., Geol. 120	5	5	4
Alg., Trig., Anal. Geom., Math 101, 102, 103	4	4	6
Eng. Draw., M.E. 101, 102, 103	2	2	2
Intro. to Agric., Agric. 101, and Farm Equip., Ag. Eng. 202	1	4	0
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
*Military Science I, Mil. 101, 102, 103	2	2	2
Bus. Corres., Eng. 211	0	0	3
Des. Geom., M.E. 201, and Farm Engines, Agr. Eng. 212	2	3	0
Calculus I, II, III, Math 201, 202, 303	4	4	4
Gen. Physics, Phys. 201, 202, 203	5	5	5
U. S. Hist., Hist. 121, 122 and Am. Govt., Pol. Sci. 211	3	3	3
Elem. Surv., C.E. 201, and Gen. Bot., Bot. 101	3	4	0
Physical Education, P.E. 201, 202, 203	1	1	1
*Military Science II, Mil. 201, 202, 203	2	2	2

Major in Agricultural and Biological Chemistry

Composition, Eng. 101, 102, 103	3	3	3
Gen. Inorg. Chem., Chem. 201, 202, and Qual. Anal., Chem. 103	5	5	4
Alg., Trig., Anal. Geom., Math 101, 102, 103	4	4	6
U.S. Hist., Hist. 121, 122, and Am. Govt., Pol. Sci. 211	3	3	3
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
*Military Science I, Mil. 101, 102, 103	2	2	2
†Elective English	3	3	3
Quan. Analysis, Chem. 211, 212, 213	4	4	4
Calculus I, II, III, Math 201, 202, 203	4	4	4
Gen. Bot., Bot. 101, 102, and Phys. Geol., Geol. 120 or	4	4	4
General and Econ. Zool., Zool. 101, 102 and Phys. Geol., Geol. 120	4	4	4
Physical Education, P.E. 201, 202, 203	1	1	1
*Military Science II, Mil. 201, 202, 203	2	2	2

Major in Dairy Manufacturing

Composition, Eng. 101, 102, 103	3	3	3
Alg., Trig., and Phys. Geol., Math. 111, 112, Geol. 120	4	4	4
U. S. Hist., and Am. Govt., Hist. 121, 122, Pol. Sc. 211	3	3	3
Gen. Bot., or Gen. Zool., Bot. 101, 102 or Zool. 101, 102	0	4	4
Gen. Field Crops or Int. to An. Ind., F.C. 101 or A.I. 101	4	0	0
Int. to An. Ind., or Gen. Field Crops, A.I. 101 or F.C. 101	0	4	0
Gen. Hort. or Gen. Poult., Hort. 101 or Poul. 101	0	0	4
Int. to Ag., Ag. 101	1	0	0
*Mil. Sc. I, Mil. 101, 102, 103	2	2	2
Physical Education and Hyg. P.E. 101, 102, 103	1	1	1
Pub. Spk. Eng. 231	0	0	3
Gen. and Org. Chemistry, Chem. 201, 202, 203	5	5	5
Gen. Econ., Econ. 201, 202	3	3	0
Gen. Bot. or Gen. Zool., Bot. 101 or Zool. 101	4	0	0
Phys. for Ag. Students, Phys. 115 and Gen. Bact., Bot. 312	0	5	4
Gen. Poul., or Gen. Hort., Poul. 101 or Hort. 101	4	0	0
Agric. Dr., Ag. Eng. 222, and Dairy Tech., D.M. 203	0	3	5
*Mil. Sc. II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

† Students certified as proficient in English may substitute courses in Modern Language. A minimum of nine credits in German is required for graduation. It is recommended that eighteen credits in German be taken by students contemplating graduate studies.

Major in Forestry

Courses	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Alg., Trig., Math. of Fin., Math. 111, 112, 113	4	4	4
Gen. and Syst. Botany, Bot. 101, 102, 203	4	4	3
El. Forestry, Gen. Zool., For. 101, Zool. 101, 102	3	4	4
Int. to Psych., Am. Govt., Psych. 200, Pol. Sc. 211	3	0	3
*Mil. Sc. I, Mil. 101, 102, 103	2	2	2
Physical Education and Hyg., P.E. 101, 102, 103	1	1	1
Physics, Gen. Econ. Phys. 115, Econ. 201, 202	5	3	3
Dendrology, Bot. 211, 213	3	0	3
Gen. and Org. Chem., Chem. 201, 202, 203	5	5	5
Wood Tech., Phy. Geol., For. 201, Geol. 120, and Elective English	3	4	†3
Surveying and Mapping I, C. E. 208, 9	0	4	4
*Mil. Sc. II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1
Surv. and Mapping, Dendrol., Mensur., Silviculture, Forest Prot., Imp., and Inf., C.E. s300, For. 214, 274, 204, 244	Summer		

Major in Landscape Architecture

Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
General Botany, Systematic Botany, Bot. 101, 102, 203	4	4	3
Arch. Draw. Arch. 107	3	3	0
Arboriculture, L. A. 101, 102, 103	1	1	1
Drawing, C. E. 101, 102, 103	1	1	1
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Business English, Public Speaking, Eng. 211, 231	3	0	3
Physical Geology, Plant Physiology, Geol. 120, Bot. 221	0	4	5
Introduction to Psychology, Introduction to Economics, Psych. 200, Econ. 205	3	3	0
Introduction to Architecture, Elements of Architecture, Arch. 201, 202, 203	3	3	3
Pencil Sketching, Arch. 100	3	0	0
Theory of Landscape Design, L. A. 212, 213	0	3	3
Surveying, C. E. 211, 212, 213	4	4	3
Plant Materials; Woody Plants, L. A. 201, 202, 203	2	2	2
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1
Surveying, C. E. s310, 3 credits	Summer		

Major in Wildlife Conservation and Management

Composition, Eng. 101, 102, 103	3	3	3
General Botany, Systematic Botany, Bot. 101, 102, 203	4	4	3
Algebra and Trigonometry, Math. 111, 112	0	4	4
U. S. Hist. and Am. Govt., Hist. 121, 122 and Pol. Sc. 211	3	3	3
General and Economic Zoology, Phys. Geology, Zool. 101, 102, Geol. 120	4	4	4
Elementary Wildlife Management, Zool. 111	1	0	0
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Public Speaking, Eng. 231 and Bus. Corres., Eng. 211	3	3	0
Gen. Inorg. and Org. Chem., Chem. 201, 202, 203	5	5	5
Ornithology, Zool. 251, 252, 253	2	2	2
Gen. Econ., 201, 202	3	3	0
Physics for Agricultural Students, Phys. 115	5	0	0
Surveying and Mapping I, C. E. 208, 209	0	4	4
Comparative Anatomy, Zool. 223	0	0	5
*Military Science, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

† Students who have been certified by the department of English as proficient in English may substitute a modern language.

ENGINEERING

Major in Aeronautical Engineering

COURSES	F	W	S
	Terms and Credits		
Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry, and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 102, 103	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing II, M.E. 101, 102, 103	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Descriptive Geometry, Machine Drawing, M. E. 201, 202	2	2	0
Shopwork, M. E. 116	1	0	0
Engineering Mechanics, E. M. 311	0	0	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Architectural Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 102, 103	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing II, M.E. 101, 102, 103	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Surveying, C. E. s200, 3 credits	Summer		
†Business English, Public Speaking, Eng. 211, 231, and elective English	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	4	4	4
Pencil Sketching, Arch. 100 abc	1	1	1
Elements of Architecture I, II, III, Arch. 201, 202, 203	3	3	3
Shades and Shadows, Arch. 205	2	0	0
Perspective Drawing, Arch. 206	1	0	0
Engineering Mechanics, E. M. 311, 312	0	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Architecture

Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
French or Modern Language, M. L. 101, 102, 201 or equivalent	3	3	3
Pencil Sketching, Arch. 100 abc	1	1	1
World History, Hist. 111, 112, 113	2	2	2
Architectural Drawing, Arch. 107	3	3	0
Descriptive Geometry, M. E. 107	0	0	3
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Background for Modern Thought or Elective	3	3	3
Physics for Engineers, Phys. 201, 202	4	4	0
History of Sculpture, Arch. 325	0	0	2
Working Drawings, Arch. 305	0	0	2
Shades and Shadows, Arch. 205	2	0	0
Perspective Drawing, Arch. 206	1	0	0
Engineering Mechanics, E. M. 311, 312	0	3	3
Elements of Architecture, Arch. 201, 202, 203	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

† Students who have been certified by the Department of English as proficient in English may substitute Modern Language for the courses listed.

Major in Ceramic Engineering

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	0	3	3
Quantitative Analysis, Chem. 212	4	0	0
Physical Geology Geol. 120	4	0	0
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys, 201, 202, 203	5	5	5
Ceramic Materials, Nonmetals mining and benefication, Cer. E. 202, 205	0	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Chemical Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E. 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	3	0
Quantitative Analysis, Chem. 211, 212, 213	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Chemical Process Principles I, Ch. E. 205	0	0	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Civil Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E. 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	0	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Descriptive Geometry, M. E. 201	2	0	0
Surveying, C. E. 211, 212, 213	4	4	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

Major in Electrical Engineering

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E. 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Electrical Design, Electrical Engineering Fundamentals, E. E. 219, 202, 203	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Geological Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E., 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	0	3
Quantitative Analysis, Chem. 212	0	4	0
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Physical Geology, Historical Geology, Mineralogy, Geol. 120, 222, 230	4	4	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Industrial Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E., 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Shopwork, Machine Shop II, M. E., 126, 227, 228	1	1	1
Industrial Organization and Management, I. E. 206, 207	3	3	0
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

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* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

Major in Industrial Engineering

(Furniture Option)

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E., 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
General Economics, Econ. 201, 202, 203	3	3	3
Shopwork, M. E. 124, 125 ,126	2	2	2
Industrial Organization, I. E. 101, 102, 103	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

Major in Mechanical Engineering

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Contemporary Civilization, C. C. 101, 2, 3	3	3	3
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
Engineering Drawing, M. E. 101, 2, 3	2	2	2
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Humanities	3	0	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Descriptive Geometry, Machine Drawing, M. E. 201, 202	2	2	0
Shopwork, M. E. 114, 115, 116	1	1	1
Engineering Mechanics, E. M. 311, 312	0	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

TEACHER EDUCATION

For Teachers of Vocational Agriculture

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Alg., Trig., and Phys. Geol., Math. 111, 112, Geol. 120	4	4	4
U. S. Hist., and Am. Govt., Hist. 121, 122, Pol. Sc. 211	3	3	3
Gen. Bot., or Gen. Zool., Bot. 101, 102, or Zool. 101, 102	0	4	4
Gen. Field Crops or Int. to An. Ind., F. C. 101 or A. I. 101	4	0	0
Int. to An. Ind., or Gen. Field Crops, A. I. 101 or F. C. 101	0	4	0
Gen. Hort. or Gen. Poult., Hort. 101 or Poul. 101	0	0	4
Int. to Ag., Ag. 101	1	0	0
*Mil. Sc. I, Mil. 101, 102, 103	2	2	2
Physical Education and Hyg., P. E. 101, 102, 103	1	1	1
English, elective	0	0	3
Gen. and Org. Chem., Chem. 201, 202, 203	5	5	5
Gen. Zool., or Gen. Bot., Zool. 101, 102 or Gen. Bot. 101, 102	4	4	0
Gen. Poul. or Gen. Hort. and Physics, Poul. 101 or Hort. 101, Phys. 115	4	0	5
Rur. Soc., or Ag. Econ. or Eng. elec., Rur. Soc. 201, Ag. Ec. 202 or Eng. elec.	3	0	0
Ag. Econ. or Rur. Soc., Ag. Econ. 202 or Rur. Soc. 201	0	3	0
Ag. Eng. or Soils, Ag. Eng. 202 or Soils 202	0	4 or 5	0
Soils or Ag. Eng., Soils 202 or Ag. Eng. 202	0	0	4 or 5
*Mil. Sc. II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

For Teachers of Industrial Arts and Teachers of Industrial Education

Composition, Eng. 101, 102, 103	3	3	3
General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Algebra, Trigonometry, Mathematics of Finance, Math. 111, 112, 113	4	4	4
Industrial Arts Drawing, Ed. (I. A.) 105a, b, c	3	3	3
Industrial Arts, Ed. (I. A.) 106a, b, c	3	3	3
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P. E. 101, 102, 103	1	1	1
Business English, Public Speaking, English Elective, Eng. 211, 231	3	3	3
Physics for Textile Students, Phys. 111, 112, 113	4	4	4
Economic History, Hist. 101, 102, 103	3	3	3
General Sociology, Soc. 202, 203	3	3	0
Industrial Arts Design, Ed. (I. A.) 205	0	0	3
Laboratory Problems in Industrial Arts, Ed. (I. A.) 206a, b, c	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

For Teachers of Industrial and Rural Recreation

Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trigonometry, Math of Finance, Math. 111, 112, 113	4	4	4
General Inorganic Chemistry and Qual. Anal., Chem. 101, 2, 3	4	4	4
Introduction to Physical Education, Rec. 101	3	0	0
Gymnastics and Stunts, Rec. 102	0	3	0
Theory of Play, Rec. 103	0	0	3
United States History, Hist. 121, 122 and Am. Govt., P.S. 211	3	3	3
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
Princ. of News and Article Writ., Bus. Corres., Pub. Spkg., Eng. 215, 211, 231	3	3	3
General Sociology, Soc. 202, 203, Hum. Physiol., Zool. 113	3	3	3
Zoology, Zool. 101, 102	4	4	0
Surv. of Agr. Indust., Ag. Ec. 221, Surv. of Eng. and Indust. Processes, Ind. Eng. 204, Surv. of Tex. Indust., Tex. 237	3	3	3
Games of Low Organization, Rec. 201	0	3	0
General Economics, Econ. 201, 202, 203	3	3	3
Introduction to Psychology, Psychol. 200	0	0	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1

TEXTILES

Majors in Textile Manufacturing, Textile Chemistry and Dyeing, Yarn Manufacturing, Tetxile Management, Weaving and Designing, Knitting.

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
General Chemistry, Ch. 101, 2, and Qual. Anal., Ch. 103	4	4	4
Algebra, Trigonometry, Analytic Geometry, Math 101, 102, 123	4	4	4
Engineering Drawing, M.E. 101, 102, 103	2	2	2
Decorative Drawing, Arch. 106	3	0	0
Textiles Principles, Cloth Calculations, Tex. 108, 131	0	3	3
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
*Military Science, Mil. 101, 102, 103	2	2	2
English or Modern Language	3	3	3
Physics, Phys. 111, 112, 113	4	4	4
Economic History, Hist. 101, 102, 103	3	3	3
General Economics, Econ. 201, 202, 203	3	3	3
Knitting, Tex. 261	2	0	0
Knitting Lab., Tex. 267, 268, 269	1	1	1
Fabric Structure, Tex. 237	0	2	0
Power Weaving, Tex. 233, 234	2	2	0
Yarn Manufacture II, Tex. 206	0	0	4
Physical Education, P.E. 201, 202, 203	1	1	1
*Military Science, Mil. 201, 202, 203	2	2	2

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, Sociology.

THE SCHOOL OF AGRICULTURE AND FORESTRY

* Leonard David Baver, Dean and Director of Instruction and Director of the Agricultural Experiment Station

† James Harold Hilton, Dean

Carey H. Bostian, Associate Dean, In Charge of Resident Instruction

Fred H. Wagoner, Administrative Assistant

Organization.—The School of Agriculture and Forestry is organized in three divisions—Resident Instruction, Agricultural Extension and the Agricultural Experiment Station—to carry on the functions of instruction, extension and research. These divisions are organized as departments as follows: (a) Agricultural Economics, including Farm Marketing and Farm Management; (b) Agricultural Engineering, including Farm Structures and Farm Machinery; (c) Agronomy, including Field Crops, Soils, and Plant Breeding; (d) Animal Industry, including Animal Husbandry, Animal Nutrition, Dairy Production, and Dairy Manufacturing; (e) Botany, including Bacteriology, Plant Physiology, and Plant Diseases; (f) Chemistry; (g) Experimental-Statistics; (h) Forestry, including Silviculture, Utilization, and Management; (i) Horticulture, including Pomology, Small-Fruit Culture, Floriculture, Truck Farming, and Landscape Architecture; (j) Poultry Science, including Poultry Diseases, Poultry Breeding, Poultry Feeding, and Poultry Management; (k) Rural Sociology; (l) Zoölogy, including Genetics, Entomology, Animal Physiology, and Wild Life Management.

Purpose.—The purpose of the School of Agriculture and Forestry is threefold: (1) To obtain through scientific research, experimentation, and demonstration accurate and reliable information relating to soils, plants, and animals, and to obtain from every available source reliable statistical, technical, and scientific data relating to every phase of agriculture that might be of advantage to the State; (2) to provide instruction in the College for young men who desire to enter the field of general agriculture, or wish to become professionals in agricultural education or specialists in any field of science related to agriculture; (3) to disseminate reliable information through publications and through extension agents, and by a wise use of this information to give instruction to agricultural workers in the scientific, experimental, and practical progress in the various lines of agriculture.

All effective instruction in agriculture is based on research and investigation; and the curricula are so organized that not only the subject matter for classroom instruction and extension work may be drawn from research, experimentation, and demonstration, but also that the students themselves shall have the opportunity to work under the direction of research specialists.

Admission; Advanced Standing.—Regulations for admission and for advanced standing are stated under Information for Applicants. (See pages 30-34.)

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* Resigned Jan. 1, 1948
† Appointed Jan. 1, 1948

Curricula.—The curricula of the School of Agriculture and Forestry are designed to meet both the practical and technical needs of the student. Moreover, the curricula provide for a broadened education by requiring certain courses and making it possible to elect others in language, literature, social sciences and the humanities.

The following curricula are offered:

A. GENERAL CURRICULUM IN AGRICULTURE

This curriculum is designed to give the student a broad training in the field of agriculture and at the same time permit him to major in the field of a particular interest. The student choosing this curriculum may elect to major in any Department of the School of Agriculture and Forestry, except Agricultural Chemistry, Agricultural Engineering, Experimental Statistics, and Forestry.

Students taking this curriculum can find professional opportunities in agricultural extension work, on the staffs of State and Federal agricultural agencies, and as farmers, farm managers, inspectors of agricultural commodities, and specialists in agricultural industries and services.

The detailed requirements for the first two years and a summary of the requirements for the upper two years are shown below. A minimum of 233 term credits and 233 honor points is required for graduation. The term credits should be distributed as follows: A maximum of 50 hours, exclusive of the first two years, in the major department; a minimum of 18 in Language, 48 in natural and physical sciences, 24 in Social Science, 12 in Military Science or alternative and 6 in Physical Education.

A. GENERAL CURRICULUM IN AGRICULTURE

Variation from this curriculum will be allowed for Pre-veterinary students with the approval of the adviser and Dean.

(For majors† in any department of the School of Agriculture except Agricultural Engineering, Chemistry, Experimental Statistics, and Forestry.)

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Algebra and Trigonometry, Math. 111, 112	4	4	0
U. S. History and Am. Government, Hist. 121, 122 and Pol. Sc. 211	3	3	3
Physical Geology, Geol. 120	0	0	4
General Botany, Bot. 101, 102 or Gen. and Economic Zoology, 101, 102	0	4	4
General Field Crops, F. C. 101 or Intro. to Animal Indus., A. I. 101	4	0	0
Intro. to Animal Industry, 101 or Gen. Field Crops, F. C. 101	0	4	0
Gen. Horticulture, Hort. 101 or Gen. Poultry, Poul. 101	0	0	4
Intro. to Agriculture, Agric. 101	1	0	0
*Military Science I, Mil. 101, 102, 103	2	2	2
Fundamental Activities and Hygiene, P. E. 101, 102, 103	1	1	1
	18	21	21

Sophomore Year

COURSES	Terms and Credits F	W	S
General Inorganic and Organic Chemistry, Chem. 201, 202, 203	5	5	†5
General and Economic Zool., Zool. 101, 102 or General Botany, Bot. 101, 102	4	4	0
Physics for Agric. Students, Physics 115	0	0	†5
General Poultry, Poul. 101 or General Horticulture, Hort. 101	4	0	0
Public Speaking, English 231	0	0	3
Rural Sociology, Rural Soc. 201 or Agric. Economics, Agr. Econ. 202	3	0	0
Agric. Economics, Agric. Econ. 202 or Rural Sociology, Rural Soc. 201	0	3	0
Farm Equipment, Agr. Eng. 202 or Soils, Soils 202	0	4 or 5	0
Soils, Soils 202 or Farm Equipment, Agr. Eng. 202	0	0	†4 or 5
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P. E. 201, 202, 203	1	1	1
	19	19 or 20	20 or 21

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

† Majors will be chosen at the end of the fifth term. Students anticipating the desire to take a full year of Organic Chemistry or a full year of Physics may omit either or both of these five-hour courses and schedule courses from the upper two years. Soils or Agricultural Engineering may be postponed to the upper two years if the major selected makes some other course more essential at this point.

Junior and Senior Years

COURSES	Credit Hours
Elective in Social Science or Humanities	3
General Economics, Econ. 201, 202	6
Elective English	6
Principles of Forestry, Forestry 111	3
Major field	30-50
Agricultural Electives	10-30
*Restricted Electives	18
Free Electives	18

(A minimum of 233 credits is required for graduation.)

* Military Science, Social Sciences, Humanities, Natural and Physical Sciences.

B. SPECIALIZED CURRICULUM IN AGRICULTURE

This curriculum is designed for students who desire to major in Experimental Statistics and for those students who want highly specialized work in any of the other Departments, and for those students who are looking forward towards graduate study in preparation for research and teaching positions. A maximum of science and a minimum of general agriculture are provided to achieve this specialization. The student choosing this curriculum may elect to major in any Department of the School of Agriculture and Forestry.

The detailed requirements for the first two years and a summary of the requirements for the upper two years are shown below. A minimum of 240 term credits and 240 honor points is required for graduation. The term credits should be distributed as follows: A maximum of 50 hours, exclusive of the first two years, in the major Department; a minimum of 27 in Language, 74 in natural and physical sciences, 27 in Social Sciences, 18 in technical agriculture, 12 in Military Science or alternative, and 6 in Physical Education.

B. SPECIALIZED CURRICULUM IN AGRICULTURE

Majors in Experimental Statistics or any other department in the School of Agriculture.

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, English, 101, 102 103	3	3	3
†General Inorganic Chemistry and Qual. Anal., Chem. 101, 102, 103	4	4	4
Algebra, Trigonometry, Analytics, Math. 101, 102, 103	4	4	6
History of the U. S. and Am. Gov't., Hist. 121, 122, Pol. Sci. 211	3	3	3
Introduction to Agriculture, Agric. 101	1	0	0
*Military Science I, Mil. 101, 102, 103	2	2	2
Fundamental Activities and Hygiene, P. E. 101, 102, 103	1	1	1
	18	17	19

Sophomore Year

Physics for Engineers, Phys. 201, 202, 203 or Elective Chemistry	5 or 4	5 or 4	5 or 4
Gen. Botany, Bot. 101, 102 or Gen. and Econ. Zool., Zool. 101, 102	4	4	0
Elective English and Public Speaking, English 231	3	3	3
Physical Geology, Geol. 120	0	0	4
Electives (see footnote following Junior and Senior years)	6 or 7	6 or 7	6 or 7
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P. E. 201, 202, 203	1	1	1
	21	21	21

† Students who do not anticipate taking more than one year of Chemistry will take Chem. 201, 202, 203.

* Or six hours in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

Junior and Senior Years*

	Credit Hours
Major Department	30-50
Natural Science (other than major)	20
Foreign Language	9
General Economics, Econ. 201, 202	6
Electives in Social Science	12
* Free Electives	26-46
	128

* A minimum of 18 hours of technical agriculture must be taken among electives of second, third, and fourth years. A minimum of 240 credits is required for graduation.

C. CURRICULUM IN AGRICULTURAL ENGINEERING

(See Page 78)

D. CURRICULUM IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

(See Page 84)

E. CURRICULUM IN DAIRY MANUFACTURING

(See Page 83)

F. CURRICULUM IN FORESTRY

(See Page 87)

G. CURRICULUM IN LANDSCAPE ARCHITECTURE

(See Page 91)

H. CURRICULUM IN WILDLIFE CONSERVATION AND MANAGEMENT

(See Page 96)

Degrees.—The degrees of Bachelor of Science in Agriculture and Bachelor of Science in Forestry are conferred upon the satisfactory completion of one of the curricula in this School.

The degree of Master of Science in Agriculture is offered for the satisfactory completion of one year of graduate study in residence.

The degree of Doctor of Philosophy is offered by certain departments.

Candidates for advanced degrees are enrolled as students in the Graduate School. For further information consult the section of the Catalog devoted to the Graduate School.

Short Courses.—These courses vary in length from a few days to eight weeks. They are designed for young people who desire some training in the principles of agriculture, but who find it impossible to take the regular college course, and for mature individuals who wish to become familiar with the most recent agricultural practices. It is the aim of these courses to make better farmers—to help them produce better fruit, vegetables, livestock, and poultry, and to obtain greater satisfaction and profit from the time, energy, and money expended.

In these courses students will receive instruction from the best professors and will use all the facilities of the School of Agriculture. Most of the courses will be given during the winter months, and a bulletin will be issued each fall announcing the courses which will be offered during the following months. This bulletin and other information about the short courses may be secured by writing to the Director of Short Courses, College Extension Division, State College Station, Raleigh, N. C.

AGRICULTURAL ECONOMICS

Professor G. W. Forster, Head of Department
Professors Martin A. Abrahamsen, C. Horace Hamilton, H. Brooks James, Marc C. Leager; Associate Professors Richard L. Anderson, R. E. L. Greene; Assistant Professor Francis Edward McVay

The Department of Agricultural Economics is concerned with all of the economic problems of the farmer, such as organization and management of the farm, farm mechanization, marketing and the processing of farm products, farm credit, landlord-tenant relations, and public policies affecting agriculture. To perform its various functions the Department is divided into two divisions—farm organization and management, and farm marketing and farm finance. Each of these divisions is under the direction of a division chief, or leader, who supervises work in research, teaching, and extension.

Facilities.—The Department is located on the second floor of Patterson Hall. It is well equipped with calculating machines and other facilities used in preparing material for farmers' use. Charts on every phase of agricultural economics are available for use of students and for other purposes. A large number of maps of actual farms are used as a basis for studying and for illustrating the principles and practices of farm management. The results of research in marketing, agricultural finance, taxation, insurance, and soil conservation practices have made a large volume of statistical information constantly available for undergraduate and graduate students. Maintained for reference is an up-to-date file of bulletins and documents covering all phases of agricultural economics.

Specialization.—Students in Agricultural Economics may specialize in Farm Business Administration, Marketing and Finance, or any other phase of farm economics, depending upon the need and desire of the student. A student may undertake specialization at the end of the sophomore year but his course of study must have the approval of the Head of the Department. Those who intend to pursue work in Agricultural Economics should, during their freshman and sophomore years, give special attention to courses in economics, accounting, statistics, and mathematics. Students may major in either the General Curriculum in Agriculture (see page 72) or the Specialized Curriculum in Agriculture. (See page 74.)

Opportunities.—There is a wide range of opportunities for students in Agricultural Economics. Graduates of the Department are engaged in college teaching, research and extension work, commerce, finance, business, and diplomatic service. Specific information as to opportunities and salaries will be supplied on request.

AGRICULTURAL ENGINEERING

Professor David S. Weaver, Head of the Department
Professor G. Wallace Giles
Associate Professor Ira L. Williams
Assistant Professor Norman C. Teter
Instructor Ezra L. Howell

Purpose.—This curriculum has been arranged to give its graduates fundamental training in engineering, basic training in the agricultural sciences, and a specialized study in courses involving the application of engineering knowledge to agricultural problems.

Breadth of Training.—Because of the great variety of work required of agricultural engineers, a number of subjects peculiar to other curricula are included, so that the student receives a considerable breadth of training. Engineering principles applied to agriculture have played an important part in the advancement and development of agricultural practices. Agricultural engineering as a profession, although of comparatively recent development, is rapidly becoming recognized as one of the more important of the engineering professions, since it is identified with the most important of industries—agriculture. This course is especially suited to the student brought up on the farm who has mechanical inclination, as it prepares him for a profession, a business, or a career in farming, and enables him to capitalize on his farm experience.

Occupations Open to Graduates.—A variety of occupations are open to graduates in Agricultural Engineering. The more important ones are Teaching, Experiment Station, and Extension Service positions with Land-Grant Colleges and the Government: Engineers in Land Reclamation, Drainage, or Irrigation Enterprises; Designing, Advertising, Sales and Promotion Work with the Manufacturers of Farm Machinery, Equipment, and Building Materials; Rural Electrification Work with Public Utilities, Farmers Electric Cooperatives, and Private Work; Editorial Work with Publishers; Appraisal; and Agricultural-Engineering Consultant Service.

Because of the varied nature of the above occupations, the work in the Agricultural Engineering Department has been divided into four Options: (1) Power and Machinery, including Rural Electrification; (2) Rural Structures, which includes Materials and Methods of Construction, Sanitation, and Building Equipment; (3) Land Improvement, which includes Irrigation, Drainage, Soil Erosion Control, and other forms of mechanical improvement of agricultural lands; (4) General Option for students planning to become county agents and those expecting to return to manage large farms where equipment and other engineering phases will play an important part in their work.

Equipment.—The offices, classrooms, and shops used in Agricultural Engineering are in the Agricultural Engineering Building. The laboratories have the latest labor-saving farm equipment for seedbed preparation, planting, cultivating, harvesting, and crop preparation. These machines are furnished by the leading farm-machinery manufacturers, and are replaced from time to time as improvements are developed. Special effort is made to have on hand all types of equipment for use in the best practices in the production of farm crops.

The Farm Buildings Laboratory is equipped with drawing tables, supply cabinets, and models of various types of farm-buildings construction.

Laboratory Equipment for Land Improvement consists of sets of surveying instruments, drafting tables, calculating equipment and field machines for this type of work.

Practice.—Field areas in crops, vineyards, orchards and pastures are available for practice in the use of farm equipment, and in drainage and erosion control.

A Bulletin Library of Agricultural Engineering is maintained for student reference.

CURRICULUM IN AGRICULTURAL ENGINEERING

Freshman Year

COURSES	Terms and Credits F	W	S
Intro. to Agriculture, Agric. 101 and Farm Equipment, Agric. Engr. 202	1	4	0
Engineering Drawing, M.E. 101, 102, 103	2	2	2
Algebra, Trigonometry, Analytical Geometry, Math 101, 102, 103	4	4	6
Composition, English 101, 102, 103	3	3	3
General Inor. Chemistry, Chem. 201, 202 and Physical Geology, Geol. 120	5	5	4
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
	18	21	18

Sophomore Year

Descriptive Geometry, M.E. 201 and Farm Engines, Agr. Eng. 212	2	3	0
Elem. Surveying, C.E. 201 and General Botany, Bot. 101	3	4	0
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Business Correspondence, Eng. 211	0	0	3
General Physics, Physics 201, 202, 203	5	5	5
United States History, Hist. 121, 122 and American Government, Pol. Sc. 211	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P.E. 201, 202, 203	1	1	1
	20	22	18

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

Junior and Senior Years

Prior to registration for the Junior Year, the student in Agricultural Engineering must select one of the following four Options into which the work of the Junior and Senior Years has been divided: Rural Structures, Land Improvements, Power and Machinery, and General.

The requirements for the Junior and Senior Years regardless of the Option are listed below. A list of other courses necessary to complete the curriculum for each option may be obtained by writing the Head of the

Department of Agricultural Engineering and specifying the Option in which the student is interested. A minimum of 235 credits is required for graduation.

COURSES	Credits
Agric. Economics, Agr. Econ. 202 and Gen. Econ; Econ. 201, 202	9
Public Speaking and Technical Writing I, Eng. 231 and 321	6
General Field Crops, F.C. 101 and General Zoology, Zool. 101	8
Rural Sociology, Rur. Soc. 201	3
Engineering Mechanics, E.M. 311, 312, 313	9
Farm-Shop Work and Terracing, Drainage and Irrig., Agr. Engr. 331, 332, 303	9
Farm Buildings and Rural Electrification, Agr. Engr. 322, 432	6
Special Problems in Agricultural Engineering, Agr. Engr. 481	3
Senior Seminar, Agr. Engr. 491, 492, 493	3
Additional Courses in Major Option	26-36
Electives in Social Science or Humanities	6
Free Electives	20-30
	118

AGRONOMY

Professor R. W. Cummings, Head of the Department

The teaching in this department is divided into two sections: Field Crops Section and Soils Section. Its objective is to provide a well-rounded practical as well as technical training for students in field crops, plant breeding, soils, fertilizers and other closely related subjects.

The combined facilities of the Consolidated University and of the Experiment Station provide excellent opportunities for advanced training leading to M.S. and Ph.D. degrees in Agronomy.

The advanced courses offered fulfill the needs of graduate work in all phases of Agronomy.

Students majoring in Agronomy (field crops and soils) will be required to take a field trip lasting several days during the Junior year, either between the Winter and Spring Terms or immediately following the end of the Spring Term.

FIELD CROPS SECTION

Professor G. K. Middleton, Head of Section

Professors W. E. Colwell, R. L. Lovvorn, J. A. Rigney; Associate Professors W. C. Gregory, G. C. Klingman and B. W. Smith

Field crops are of importance in North Carolina as a major source of farm income, as feed for livestock, and for use in soil conservation and soil improvement practices. Soil and climatic variations are such that a wide diversity of crops is grown, making this an ideal state in which to study crop production.

Opportunities in plant improvement are also recognized and the curriculum is set up to give instruction in both crop production and plant breeding. The curriculum is flexible, making it possible for students to elect sufficient courses in other departments for a general training in agriculture or for specialization in preparation for graduate work in Agronomy.

The more general training will equip students for work with the Agricultural Extension Service or with one of the several agencies administered by the United States Department of Agriculture; or as better farmers. Students interested in preparing themselves for one of these fields of endeavor should take the General Curriculum in Agriculture given on page 72 during the first two years.

Advanced training is provided for those who desire to go into the more technical phases of crop production or plant breeding, such as teaching or research in State or Federal institutions. Students who know before entering college that they plan to take this advanced training should follow the Specialized Curriculum in Agriculture given on page 74.

Junior and Senior Curricula

See pages 72 or 74 for Freshman and Sophomore curricula*

The following courses will be required of students in either the General or Specialized curriculum.

COURSES	Credit
Crop Production I: Food and Feed Crops, F. C. 301	4
Pasture and Forage Crops, F. C. 403	5
Plant Breeding, F. C. 412	3
Soil Fertility and Fertilizers, Soils 301	5
Soil Classification, Soils 302	3
Genetics, Zool. 411	5
Plant Diseases, Bot. 315	4
Plant Physiology, Bot. 321	5

Additional courses will be selected from a list approved by the department to satisfy the requirements listed on pages 72 and 74 for the curriculum in General or Specialized Agriculture, respectively.

SOILS SECTION

Professor J. F. Lutz, Head of Section

Professors R. W. Cummings, W. L. Nelson, J. F. Reed

Associate Professor W. D. Lee

The soil is a natural body composed of mineral and organic matter, air, water, and living micro-organisms. The reactions of and changes in these components extend into the fields of chemistry, geology, physics and biology, which sciences are fundamentals to soils. No state in the Union offers better opportunities for soil and fertilizer studies than North Carolina for within her borders are soils derived from a large variety of parent materials and developed under climatic conditions varying from a subtropical climate in the southeastern part of the state to the cooler climates of the mountains. This state has been one of the few which has steadily pushed forward her soil-survey work so that now county soil-survey reports and maps are available for practically all the counties of the entire state.

The importance of soils in North Carolina agriculture is evidenced by

* Students interested in graduate study or technical work in Field Crops should take the Specialized Curriculum in Agriculture.

the fact (1) that more fertilizer is used in North Carolina than in any other state in the Union and (2) that North Carolina ranks third among the states in cash income derived from farm crops.

The curriculum in Soils is made flexible, through a sufficient number of optional courses, to enable the student to prepare for (1) general agricultural work such as farmers, county agents, soil conservationists, and similar work, or (2) technical soils work such as teaching or research in State or Federal institutions. Those interested in the more technical phases should take the Specialized Curriculum in Agriculture given on page 74.

Junior and Senior Curricula

See pages 72 or 74 for Freshman and Sophomore Curricula*

The following courses will be required of students in either the General or Specialized Curriculum:

COURSES	Credit
Soils 301, Soil Fertility and Fertilizers	5
Soils 312, Soil Classification	3
F. C. 301, Crop Production I: Food and Feed Crops	4
F. C. 403, Pastures and Forage Crops	5
Bot. 321, Plant Physiology	5
Zool. 411, Genetics	5

Additional courses must be selected, from a list approved by the Department, to satisfy the requirements listed on pages 72 and 74 for the curriculum in General or Technical Agriculture, respectively.

ANIMAL INDUSTRY

Professor D. W. Colvard, Head of the Department

Professors D. E. Brady, W. L. Clevenger, C. D. Grinnells, F. M. Haig, E. H. Hostetler, W. J. Peterson, W. M. Roberts, R. H. Ruffner, F. W. Sherwood, H. A. Stewart; Associate Professors W. S. Arbuckle, F. E. Elliot, Marvin L. Speck, R. K. Waugh, and J. A. Weybrew; Assistant Professors J. P. Ammerman, Jr. T. N. Blumer and J. C. Pierce, Jr.; Instructors Lemuel Goode and M. L. Shumaker.

The curriculum in Animal Industry is designed to train students in various phases of animal husbandry and dairying. The department is housed in Polk Hall, a three-story building, which was designed to meet the needs of college teaching, research, and extension work in animal production and dairy manufacturing.

In the basement of Polk Hall are two wings, one of which is devoted to Dairy Manufacturing, and the other to Farm Meats and Food Processing. The dairy laboratories have recently been remodeled and equipped with the most modern machinery available for teaching and research in the processing and distribution of market milk, ice cream, butter, cheese and other dairy products.

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* Students interested in graduate study or technical work in Soils should take the Specialized Curriculum in Agriculture listed on page 74.

The Farm Meats and Food Processing laboratories have just been remodeled and expanded, making them among the most modern and up-to-date of any in the country.

The upper floors of the building contain offices, classrooms, library and laboratories, in dairy bacteriology, dairy chemistry, animal nutrition, animal breeding and meats. Extension specialists in swine, dairy, beef cattle, and sheep have offices in this building.

In addition, the Department of Animal Industry maintains three livestock farms located a few miles from the college.

The dairy farm contains 600 acres. Two fire-proof, completely equipped dairy barns house 140 registered Jerseys, Guernseys, and Holsteins. A herd of registered Ayrshires is maintained in the College Experiment Station Dairy nearby. The animal husbandry farm, adjoining the dairy farm, contains 1100 acres. Here, registered and commercial herds of swine, sheep, horses, and beef cattle are maintained for research and teaching.

Students wishing to specialize in Animal Industry may do so after completing either Curriculum A or Curriculum B in the Basic Division. Two curricula are offered in the department—one in Animal Industry, the other in Dairy Manufacturing. Students specializing in Animal Industry after completing Curriculum A in the Basic Division will be required to take not less than 36 hours of course work in the Animal Industry curriculum. These include: Types and Market Classes of Livestock; Judging and Selection (dairy cattle); Judging and Selection (general livestock); Animal Nutrition I and II; Livestock Production I, II, and III; Animal Breeding; and Livestock Practicums.

Students completing Curriculum B and wishing to specialize in some phase of Animal Science will elect courses in the Department of Animal Industry under the supervision of a faculty committee. Since this curriculum is very flexible, it makes it possible for students to specialize in preparation for graduate work in Animal Breeding, Nutrition, and other animal sciences.

Students wishing to specialize in Dairy Manufacturing will be required to take the courses listed in the special curriculum designed for Dairy Manufacturing, which is shown below.

CURRICULUM IN DAIRY MANUFACTURING

Freshman Year

Same as General Curriculum in Agriculture (See page 72).

Sophomore Year

COURSES	Terms and Credits F	W	S
General Inor. and Org. Chem., Chem. 201, 202, 203	5	5	5
General Economics, Econ. 201, 202 and Public Speaking, Eng. 231	3	3	3
General Botany, Bot, 101 or General Zoology, Zoology, Zool. 101	4	0	0
General Poultry, Poul. 101 or General Horticulture	4	0	0
Physics for Ag. Stud., Phys. 115 and Bacteriology, Bot. 312	0	5	4
Agric. Drawing, Agr. Engr. 222 and Dairy Technol., D. M. 203	0	3	5
*Military Science II, Mil. 201, 2, 3	2	2	2
Sports Activities, P.E. 201, 2, 3	1	1	1
	19	19	20

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

Junior and Senior Years

COURSES	Credits
Elective in Social Science	3
English Electives	6
Major Department	30-50
Required Courses Outside Major	20-40
Restricted Electives	18
Free Electives	18
	115

Note: 1. A minimum of 233 credits is required for graduation.

2. Courses for Major Department and required courses outside major must be chosen with the approval of the adviser.

3. Restricted Electives must be Military Science or in Social Sciences, Humanities, Natural and Physical Sciences.

BOTANY

Professor B. W. Wells, Head of the Department
Professors D. B. Anderson, J. H. Jensen, S. G. Lehman, I. V. Shunk; Associate Professors C. N. Clayton, D. E. Ellis; Assistant Professors Ernest Ball, Richard J. Campana, W. B. Fox, R. K. Godfrey, H. T. Scofield, L. A. Whitford.

Equipment and Facilities

Location.—The Department of Botany occupies the second floor of Winston Hall.

Laboratories.—The laboratories are all equipped with projection lanterns. A well-organized herbarium supports the work in systematic botany and dendrology.

Greenhouses.—Ample greenhouse facilities are available for work in physiology and pathology.

Purpose.—The Department emphasizes those phases of plant science which are foundational for the work in Agriculture and Forestry.

Curricula.—In this department students may specialize in plant pathology or other phases of plant science which are basic for advanced work in Agriculture and Forestry. The degree of Bachelor of Science in Agriculture may be earned under the provisions of either the General Curriculum (see page 72) or the Specialized Curriculum (see page 74).

CHEMISTRY

Professor A. J. Wilson, Head of the Department

Professors W. J. Peterson, G. H. Satterfield, F. W. Sherwood, P. P. Sutton, L. F. Williams; Associate Professors H. L. Caveness, W. E. Jordan, R. H. Loeppert, W. A. Reid, M. F. Showalter; Assistant Professor R. C. White; Instructors T. J. Blalock, D. D. Daniel, Jr., Ruth M. Greenberg, W. P. Ingram, Jr., J. W. Marek, J. W. Morgan, H. B. Ohmer, G. M. Oliver.

Curriculum.—The Department of Chemistry does not offer a Bachelor of Science degree in Chemistry. However, a student may register in the School of Agriculture with a major in Agricultural and Biological Chemistry. This curriculum affords extended courses of chemical training which will fit a graduate for positions such as those in State Experiment Stations, and in State and Federal laboratories for the inspection and control of fertilizers, feeds, foods, and other commodities, and as chemist in industrial plants.

CURRICULUM IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Freshman Year

COURSES	Terms and Credits F	W	S
General Inorganic and Qualitative Chemistry, Chem. 201, 202, 103	5	5	4
Composition, English 101, 102, 103	3	3	3
Algebra, Trigonometry, Analytical Geometry, Math 101, 102, 103	4	4	6
History of the U. S., Hist. 121, 122 and Amer. Government, Pol. Sci. 211	3	3	3
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
	18	18	19

Sophomore Year

COURSES	F	W	S
Quantitative Analysis, Chem. 211, 212, 213	4	4	4
Calculus I, II, III, Math 201, 202, 203	4	4	4
General Botany, Bot. 101, 102 or General and Econ. Zool., Zool. 101, 102	4	4	0
Physical Geology, Geol. 120	0	0	4
†Elective English	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P.E. 201, 202, 203	1	1	1
	18	18	18

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

† Students certified as proficient in English may substitute courses in modern language. A minimum of nine credits in German is required for graduation. It is recommended that eighteen credits in German be taken by students contemplating graduate studies.

Junior Year

COURSES	Terms and Credits F	W	S
Organic Chemistry, Chem. 421, 422, 423	5	5	5
Physics for Engineers, Physics 201, 202, 203	5	5	5
German or Electives	3	3	3
Gen. and Econ. Zoology, Zool. 101, 102 or Gen. Botany, Bot. 101, 102	4	4	0
Electives	5	5	7
	22	22	20

Senior Year

Physical Chemistry, Chem. 431, 432, 433	4	4	4
Elective Chemistry	4	4	4
Agric. Economics, Agr. Econ. 202 and General Econ., Econ. 201, 202	3	3	3
Electives	9	9	9
	20	20	20

Electives must include a minimum of 6 credits in Social Sciences, and if Advanced Military Science is elected, a minimum of 11 credits in Technical Agriculture. If Advanced Military Science is not elected, electives must include a minimum of 18 credits in Technical Agriculture. A minimum of 233 credits is required for graduation.

FORESTRY

Professor J. V. Hofmann, Director of the Division
Professor L. Wyman
Associate Professors W. D. Miller, G. K. Slocum, J. W. Chalfant, C. M. Kaufman

Areas for Field Work.—Some of the field work of the Department of Forestry is now carried on at the **Camp Polk Prison Farm,** near the State Fair Grounds, which has 300 acres of timber land.

The George Watts Hill Demonstration Forest, near Durham, is a tract of 1,400 acres. It contains stands of short-leaf and loblolly pine, oaks, gum, tulip, dogwood, and all of these species in different associations. A rolling terrain, it serves admirably for the study of forest problems in the Piedmont Section.

The Hofmann Forest.—A large tract of land in Jones and Onslow Counties, in the southeastern part of the State, consists of more than 80,000 acres and has the various types of timber found in this region. The large areas of virgin timber make a very complete laboratory for studying forest development and succession.

Total Areas.—In all, the Forestry Department has available about 82,000 acres on which to do field work, demonstration, and research. These areas include the various types found in North Carolina except those of the Mountain Region.

The Arboretum area of seventy acres near Raleigh is being developed to contain all of the tree species and associated shrubs that grow in this climatic condition. It contains swamp and upland which adapts it for this use. More than a hundred species have been planted in this area.

The Wood Technology Laboratory contains a representative collection of the more common woods and will be gradually extended.

The Timber-Testing Laboratory contains the machines for its work.

Greenhouse space is available for special problems in forest research.

Purposes of the Curriculum.—The aims of the curriculum in Forestry are: (1) to train young men for work in the technical and applied fields of forestry on public or private forest land; (2) to give special training in fields of research; (3) to advance the knowledge of the entire profession.

Forestry as a Profession.—The profession of forestry is comparatively young in North Carolina. It began some forty years ago and has made remarkable progress during its first four decades of existence. The next decade promises more advancement and achievement than all the past, as the foundation has been laid; the building of the superstructure will depend upon the expertness of the builders. In the ranks of the builders are included the United States Forest Service; State Forest Departments in a large number of States; corporations and lumber companies; individual land-owners; last but by no means least, the farm woodlands.

Occupations.—Students completing the Forestry course may look to the following fields of employment: United States Forest Service, the State Service, including not only North Carolina but especially the Southern States, and other State organizations; the lumber companies, timber-holding companies, corporations, and individuals. The forestry program in the State of North Carolina is very materially strengthened by the presence of the National Forests and the Southeastern Forest Experiment Station. These will be of direct aid in the study of forest-research problems, management problems and the organization and work of the National Forest Service.

Forest Management aims to make a forest property a permanent producing unit. All forestry is now being built on this basis.

Forest Utilization requires special courses dealing with the value and various uses of the products of the forest. During the third term of the senior year, field studies of woodworking industries, logging operations, paper and pulp mills, and problems in forest management take up most of the time.

Silviculture deals with the problems of producing a forest, such as selection of species, methods of reproduction, cutting systems. The work is becoming increasingly important as our virgin timber supply is depleted.

Research in Forestry is being recognized as important by all agencies in the fields of forestry. Men trained in research methods are needed in the Government Experiment Stations, State Experiment Stations, and private laboratories.

Graduation.—A minimum of 240 term credits with at least 240 honor points is required for graduation in Forestry.

The spring term of the junior year will be given on the Hofmann Forest, and will include timber measurement, timber cruising, and utilization.

Summer Instruction in Forestry.—The regular summer instruction in forestry for sophomores is given during the ten weeks immediately following the Commencement.

The expenses for the entire period are as follows:

Registration fee	$ 5.00
For each credit scheduled	3.00
Room	20.00
Board (estimated)	50.00
Laboratory fee	20.00

The courses listed below for summer camp are required and carry the regular college credit as indicated. The work is carried on entirely in the field and the class is responsible for its own program of camp routine. The students furnish their own board and any facilities other than the beds and housing. The registration in these courses is restricted to regularly enrolled students, unless a student is admitted as a special student under the same conditions that a special student would be allowed to take work in the regular courses.

D. CURRICULUM IN FORESTRY

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trigonometry, Math. of Finance, Math. 111, 112, 113	4	4	4
General and Systematic Botany, Bot. 101, 102, 203	4	4	3
*Drawing, C. E. 101, 102, 103	1	1	1
Elementary Forestry, For. 101	3	0	0
Introduction to Psychology, Psychol. 200	3	0	0
American Government, Pol. Sc. 211	0	0	3
General and Economic Zoology, Zool. 101, 102	0	4	4
*Military Science I, Mil. 101, 102, 103	2	2	2
Fundamental Activities and Hygiene, P. E. 101, 102, 103	1	1	1
	21	19	21

Sophomore Year

General Economics, Econ. 201, 202	0	3	3
Physics for Agric. Students, Physics 115	5	0	0
Dendrology, Bot. 211, 213	3	0	3
General Inorganic and Organic Chemistry, Chem. 201, 202, 203	5	5	5
Wood Technology, For. 201 and Physical Geology, Geol. 120	3	4	0
Surveying and Mapping I, C. E. 208, 209	0	4	4
†Elective English	0	0	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P. E. 201, 202, 203	1	1	1
	19	19	21

* Not required beginning September 1948. Credits to be made up by departmental recommendation.

Summer Camp
(Ten weeks at Hill Forest)

COURSES	Credits
Surveying and Mapping, C. E. s300	3
Dendrology, For. s214	2
Mensuration, For. s274	2
Silviculture, For. s204	3
For. Protection, Improvements, and Influences I, For. s244	2
	12

Junior and Senior Years
(Spring term of Junior Year at Hofmann Forest)

†Elective English	6
Plant Physiology, Bot. 321 and Plant Ecology, Bot. 441	8
Economic Entomology, Zool. 213	4
Soils, Soils 202	5
Introduction to Exp. Statistics, Stat. 311	3
Land Economics, Agr. Econ. 212	3
Plant Diseases, Bot. 315	4
Electives in Social Science	6
Non-Forestry electives	19
Forestry courses	50
	108

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

† Students who have been certified by the Department of English as proficient in English may substitute for the courses listed a modern language.

A minimum of 240 credits is required for graduation.

HORTICULTURE

Professor M. E. Gardner, Head of the Department
Professors F. D. Cochran, I. D. Jones, G. O. Randall; Associate Professors E. B. Morrow and Robert Schmidt; Assistant Professor J. G. Francis.

The Field.—The production of tree fruits and nuts, small fruits and grapes, and floral crops, including bulbs, under glass and in the open requires intensive methods and suitable conditions from the standpoint of favorable sites, soils and climate. Since North Carolina extends from the Atlantic Ocean to the highest peak east of the Rockies, it is not difficult to find, somewhere within the borders of the state, almost ideal conditions for the production of practically all of the Horticultural crops grown in the temperate zone. In addition to these natural advantages, the nearness of large eastern markets and rapid transportation facilities place the state in an enviable position among the states of the Nation.

The Facilities.—The department operates four greenhouses and two propagating houses with a total of thirteen thousand square feet under glass. A number of research projects with fruits, vegetables and ornamental plants are being conducted at the McCullers branch station near Raleigh and are available to students for observation and study. The same is true of floral and other crops grown in the greenhouses. The department library contains approximately twenty-five thousand technical and popular bulletins and periodicals covering all phases of Horticulture, and complete bound volumes of the Proceedings of the American Society for Horticultural Science, Horticultural Abstracts, Journal of Agricultural Research and others.

A new student laboratory building was completed in the fall of 1947. This laboratory is located on a twenty-five acre plot of land near the city limits of west Raleigh. It will fill a long felt need and greatly improve the teaching facilities of the Department. A modern processing laboratory has also been completed and equipped. Facilities are available for instruction in canning, quick freezing, and other methods of processing fruits and vegetables.

The Opportunities.—Students will have the choice of one of three options: Pomology, Vegetable Gardening or Floriculture. The curriculum in each will be flexible enough to permit the student to prepare himself for work in General Agriculture or Technical Agriculture. Those students who are interested in general agriculture should elect the General Curriculum in Agriculture outlined on page 72. This curriculum will provide training for those who are interested in becoming County Agents, fruit and vegetable growers, nurserymen, or in the production of greenhouse crops. A student interested in the more technical phases of Horticulture should register for the Specialized Curriculum in Agriculture on page 74. This will give a better background for graduate work and will lead to teaching and research positions with State Experiment Stations and Colleges, Federal agencies, or industries.

Juniors and Seniors

The following courses will be required of all students in either the General or Specialized curriculum:

COURSES	Credits
Zool. 411, Genetics	5
F. C. 412, Plant Breeding	3
Bot. 321, Plant Physiology	5
Soils 301, Soil Fertility and Fertilizers	5
Bot. 315, Plant Diseases	4

Each student will have the privilege of specialization in Fruit, Vegetable or Flower growing at the beginning of the junior year. In addition to the courses listed as required, the student will schedule, with the approval of the Department, courses which will satisfy the requirements for specialization in his chosen field.

LANDSCAPE ARCHITECTURE

Professor Edwin G. Thurlow, Head of the Department

Professors L. A. Enersen, G. O. Randall, and Morley J. Williams
Associate Professor Robert Schmidt

A comparative study of Landscape Architecture with architecture, the oldest art of design, will disclose the fact that distinct parallelism exists between these two fields of human endeavor. Not only in the character and extent of the training required in each case is this shown, but also in the division of work which takes place, and in the relations existing among those responsible for various parts of the work in the practice of these two closely associated professional fields.

Training in Landscape Architecture is a composite derived from the fine arts, certain branches of engineering, and ornamental horticulture. Properly, it is dominated by the principles of design, and therefore may be correctly classified as a fine art. Its province is the design of landscapes, the preparation of plans and specifications for them, and supervision during construction.

The Curriculum in Landscape Architecture is strictly undergraduate. Its purpose is to provide a broad and thorough foundation for the additional postgraduate training which the profession requires of those desiring to enter its ranks. It also presents an open door to the professional fields of city or regional planning as the student may elect when undertaking graduate work. The soundness of the curriculum here presented is attested not only by the fact that at no time has the demand for the services of its graduates been fully satisfied, but also by the successes of those who have pursued graduate training and attained to full rank in the professional field of Landscape Design.

Training in Landscape Construction is similar to that in Landscape Architecture, but with emphasis upon materials and methods of construction employed in engineering and ornamental horticulture.

Training in Landscape Gardening is essentially ornamental horticulture. In neither case is graduate work required, since their provinces will not include the design of landscape, but only the execution of plans under supervision in the one case, and the maintenance of the constructed landscape in the other. Students electing either of these two lines of study will, during their first two years, pursue the **Basic Curriculum in General Agriculture,** with two or three substitutions from other curricula, as indicated.

General Equipment and Special Facilities for instruction are ample in the combined resources of Civil and Architectural Engineering, Horticulture, and Landscape Architecture.

Plant Materials in extensive collections on the College grounds and at various points elsewhere within a short distance, furnish an ample supply of all kinds for both study and use. In addition, several notable collections are available for occasional visits and study.

The Material for **Landscape Design and Construction** available on College grounds, private properties, and numerous public and semipublic areas and institutions in and about Raleigh, provide a wide range of subjects for study and practice. The City of Raleigh itself is a most interesting city-planning study, since it is one of the very few existing examples of a capital city which was planned in advance of its building.

CURRICULUM IN LANDSCAPE ARCHITECTURE

Freshman Year

COURSES	CREDITS First Term	Second Term	Third Term
Algebra, Trigonometry, Analytical Geometry, Math. 101, 102, 103	4	4	6
Composition, Eng. 101, 102, 103	3	3	3
Botany, General and Systematic, Bot. 101, 102, 203	4	4	3
Architectural Drawing, Arch. 107ab	3	3	0
Arboriculture, L.A. 101, 102, 103	1	1	1
Drawing, C.E. 101, 102, 103	1	1	1
Military Science I, Mil. 101, 102, 103	2	2	2
Fundamental Activities and Hygiene, P.E. 101, 102, 103	1	1	1
	19	19	17

Sophomore Year

Business English and Public Speaking, Eng. 211, 231	3	0	3
Plant Physiology, Bot. 221	0	0	5
Pencil Sketching, Arch. 100	3	0	0
Physical Geology, Geol. 120	0	4	0
Introduction to Economics, Econ. 205	0	3	0
Introduction to Psychology, Psychol. 200	3	0	0
Introduction to Architecture, Arch. 201	3	0	0
Elements of Architecture, Arch. 202, 203	0	3	3
Surveying, C. E. 211, 212, 213	4	4	3
Plant Materials: Woody Plants, L.A. 201, 202, 203	2	2	2
Theory of Landscape Design, L.A. 212, 213	0	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
	21	22	22

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

Junior Year

Plant Materials: Herbaceous Plants, L.A. 303	0	0	2
Plant Ecology, Bot. 441	3	0	0
History of Landscape Design, L.A. 311, 312	3	3	0
Landscape Design I, L.A. 321, 322, 323	4	4	4
Technical Writing, Eng. 321	0	0	3
Shade and Shadows, Arch. 205	2	0	0
Freehand Drawing I, Pen and Pencil Drawing, Arch. 102	0	2	0
Freehand Drawing II, Water Color, Arch. 101	2	0	0
Freehand Drawing III, Charcoal, Arch. 103	0	0	2
Economic Zoology and Entomology, Zool. 102, 213	0	4	4
History of Architecture, Arch. 321, 322	3	3	0
*Electives	3	3	3
	20	19	18

Senior Year

Planting Design, L.A. 411, 412, 413	3	3	3
Landscape Design II, L.A. 421, 422, 423	4	4	4
City Planning, L.A. 432	0	3	0
Landscape Construction, L.A. 451, 452, 453	2	2	2
Perspective Drawing, Arch. 206	1	0	0
Accounting for Engineers, Econ. 212	3	0	0
Appreciation of Fine Arts, Arch. 111, 112, 113	3	3	3
Business Law, Econ. 307	0	0	3
*Electives	3	3	3
	19	18	18

* Elective credit must include 12 credits in Social Science.

POULTRY SCIENCE

Professor R. S. Dearstyne, Head of the Department

Associate Professors E. W. Glazener, J. W. Kelly

Assistant Professors F. W. Cook, and N. W. Williams

Laboratories.—The Poultry Department is housed on the second floor of Ricks Hall. It embraces the Disease Diagnostic, the Anatomy-Hematology, and Disease Research Laboratories, the Incubator Room, and two Live Bird Laboratories. The laboratories are well equipped for teaching and research.

The Seminar Room.—Affording access to technical and to popular publications, to preserved pathological specimens, is open to the students at all times.

Purposes and Scope.—The Poultry Department, as a major division of the School of Agriculture and Forestry, serves North Carolina through teaching, research, and extension. Its research personnel embraces the field of avian genetics, parasitology, sero-bacteriology, histology, pathology and hematology. It has two poultry farms (chickens and turkeys) near the campus and two Experiment Station farms in the eastern and western parts of the state. The staff devotes its full time to poultry problems of the student, the poultryman and the industry. It serves a chicken and turkey farm industry of nearly 10,000,000 birds in North Carolina valued at approximately $30,000,000. It cooperates with the commercial concerns allied with poultry.

Central Poultry Plant.—Consists of forty buildings located on seventeen acres. Six laying houses and sixteen mating pens house approximately 250 breeders and 1,500 layers. All layers of three breeds of chickens are pedigreed and trap-nested. About 4,000 chicks are produced each year, all of these being pedigreed. An 18,000 capacity incubator is used for teaching commercial incubation.

Central Turkey Plant.—Consists of seven new buildings located on twenty-five acres. One laying house and six mating pens house approximately 250 large bronze turkeys, all pedigreed and trap-nested. One 1,500-capacity incubator is used.

These two Plants provide abundant material for teaching and demonstrating principles of poultry management, breeding, judging and sanitation.

Disease Diagnostic Laboratory.—Serves directly and indirectly the poultrymen of the State. Approximately 30,000 birds have been autopsied since 1923; 3,000 are now autopsied annually. One thousand or more poultrymen are reached each year by correspondence and 250 receive personal attention in the laboratory. The birds received serve as excellent material for teaching, for laboratory material in the courses in anatomy and poultry diseases, and for investigational work in avian bacteriology, sero-bacteriology, anatomy, histology, pathology, hematology and parasitology.

Research.—A substantial research program is pursued in genetics, sero-bacteriology, histology, pathology, hematology and parasitology.

CURRICULUM A

(See page 72.)

Students majoring in Poultry Science will be required to take the following courses in Poultry Science: Poultry Anatomy, Poultry Judging, Poultry Nutrition, Commercial Poultry Production, Incubation and Brooding, Poultry Diseases (2 terms), Sero-diagnosis in Poultry Diseases. Preparation and Grading of Poultry Products, Poultry Breeding, Turkey Production, and Poultry Seminar.

Other required courses in junior and senior years are Animal Physiology, Genetics, Bacteriology, and General Economics (2 terms).

CURRICULUM B

(See page 74.)

The entire program for the junior and senior years for students majoring in Poultry Science will be developed in each instance by a committee of the Poultry Department.

RURAL SOCIOLOGY

Professor C. Horace Hamilton, Head of the Department

Professors G. W. Forster, Sanford Winston; Associate Professor Selz C. Mayo; Assistant Professor L. Walter Seegers; Instructor E. A. Wilkening.

Objectives.—The principal objectives of this department are: (1) to give all students an appreciation of the human and social values in agriculture and rural life; (2) to give the future farmer and rural citizens an understanding of the social problems of the rural community; (3) to train rural leaders in methods of group organization and social control; (4) to train a few exceptional young men in rural sociological research and extension methods.

Relation to Other Departments.—The Department of Rural Sociology is closely related to and dependent upon Social Science Departments in the College and in the Consolidated University. Students specializing in rural sociology will be expected to take courses in such departments as: Sociology, Psychology, Statistics, Agricultural Economics, History, and Political Science. The Department of Rural Sociology functions also in a service capacity to Agricultural Departments and other rural agencies. Students taking courses in technical agriculture may take one or more courses in Rural Sociology as an elective Social Science.

Laboratory and Research Facilities.—The Department of Rural Sociology is constantly engaged in statistical and sociological studies of rural population, rural standards of living, rural communities, and related problems. Funds, laboratory equipment, and other facilities for this work are provided by the Agricultural Experiment Station and are available for the use of advanced students specializing in the field of Rural Sociology.

In a broader sense, the entire State is a laboratory for the study of rural social problems. Field trips and extended surveys may be carried out by advanced students during the summer months.

New Opportunities.—The field of rural social work offers new opportunities for agricultural graduates who have specialized in rural sociology. There is a great need now for men particularly, to fill administrative positions in all kinds of social security and welfare organizations, public and private. The rural sociology curriculum is designed to prepare agricultural college graduates for advanced professional training in social work and administration.

Curricula.—In the Department of Rural Sociology students may major in either the General Curriculum in Agriculture (page 72 or the Specialized Curriculum in Agriculture (page 74).

STATISTICS (Experimental Statistics)

Professor Gertrude M. Cox, Head of the Department; Professors W. G. Cochran, R. E. Comstock, J. A. Rigney; Associate Professors R. L. Anderson, H. L. Lucas, Paul Peach; Assistant Professor H. F. Robinson; Instructor R. J. Monroe; Research Instructors Margaret Fleming and Sarah Porter; Assistant Statisticians Jay T. Wakeley and R. M. Harding.

The extension of the use of statistics to more and more diverse fields of application has steadily increased since the first World War. Industry is placing increasing reliance on statistical methods to control the quality of goods in the process of manufacture and to determine the acceptability of goods already produced. Statistical procedures are becoming basic tools for making weather forecasts, crop and livestock estimates ,business trend predictions, opinion polls and the like. Furthermore, all fields of research are fast realizing the importance of statistical aids in planning, analyzing and interpreting the results of investigations.

Organization.—The Department of Experimental-Statistics is a part of the Institute of Statistics. It provides instruction, consultation and computational service for all other departments of all schools in the college. The Agricultural Experiment Station receives assistance in designing experiments, analyzing, and interpreting results. Governmental agencies and other institutions use the facilities of the Department. The range and quality of data handled furnish an excellent background for training students in the use of statistical procedures in such fields as the plant, animal and social sciences and industrial engineering.

Laboratory.—A laboratory equipped with the best facilities available is maintained. Calculating machines, comptometers and International Business Machines are used constantly. Students have an opportunity to get actual experience in the use of these machines and to learn the types of data for which each is best suited.

Curriculum.—The curriculum in Experimental-Statistics is based on the Specialized Curriculum in Agriculture as shown on page 74 and provides for options in Plant Science, Animal Science, Agricultural Economics, and Rural Sociology.

ZOOLOGY AND ENTOMOLOGY

Professor Z. P. Metcalf, Head of the Department

Professors C. H. Bostian, B. B. Brandt, B. B. Fulton, T. B. Mitchell, C. F. Smith; Associate Professors F. M. Barkalow, John L. Evers, R. Harkema; Assistant Professors D. S. Grosch, W. M. Kulash, and M. W. Wing.

Teaching and Research.—The space devoted to Zoology is equipped to present the various subjects and to carry on research in its own and related fields. The Entomology Laboratory has a large Insectary with the usual equipment, and has an especially large collection of breeding animals for research and instruction in the field.

Beekeeping.—The Beekeeping Laboratory is well provided with apparatus to illustrate all phases of beekeeping. A small apiary is maintained on the College grounds.

Graduate Work.—The Technique and Graduate Laboratories are especially well equipped for the teaching of graduate work. The Museum contains a synoptic collection illustrating most groups of animals.

Curricula.—The Department of Zoology offers curricula in Entomology and in Wildlife Conservation and Management set forth as follows. In Entomology students may major in either the General Curriculum in Agriculture (page 72) or the Specialized Curriculum in Agriculture (page 74).

WILDLIFE CONSERVATION AND MANAGEMENT

Curriculum.—Interest in wildlife, hunting and fishing is a prerequisite of a wildlife biologist, but enthusiasm alone is not sufficient. A student must possess scholastic aptitude, initiative, and the ability to use the tools of pure and applied biology.

The wildlife curriculum is based on the following principles: all major forms of plant and animal life must be considered in wildlife management; by providing a favorable environment, a wildlife species will usually produce surpluses which can be harvested. Since wildlife conservation and management is essentially applied biology, a thorough knowledge of the fundamentals of zoology and botany is imperative.

Every phase of the wildlife field requires numerous contacts with the public. The ability to speak and write in an effective manner is a necessity. For this reason English is stressed. Stream pollution problems require a knowledge of chemistry for their solution. Courses in chemistry are, therefore, emphasized.

Two field trips are taken during the fall quarter of the senior year for the purpose of participating in controlled hunts sponsored by the North Carolina Wildlife Resources Commission. A spring field trip to the mountains is also required of all seniors.

Positions.—Because of the limited employment opportunities in the field, poor and mediocre students are discouraged from entering this curriculum. It is expected that in a few years there will be a surplus of wildlife technicians and only graduates in the higher brackets will be able to secure jobs.

Four categories of positions are available to wildlife graduates: administrative, law enforcement, refuge, and research. Those agencies employing the majority of men are: state game and fish departments, U. S. Fish and Wildlife Service, U. S. Forest Service, U. S. Soil Conservation Service, U. S. National Park Service, and other federal land-use departments. The curriculum is designed to furnish a technical and practical foundation for employment with these agencies.

State Advantages.—Unusual advantages are offered by the wide range of natural environments in the North Carolina Coastal Plain, Piedmont, and Mountain Regions. Close cooperation with the North Carolina Wildlife Resources Commission provides opportunities for observing developments in wildlife management on its fifteen wildlife management and refuge areas.

CURRICULUM IN WILDLIFE CONSERVATION AND MANAGEMENT

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
General and Systematic Botany, Bot. 101, 102, 203	4	4	4
Mathematical Analysis, Math. 111, 112	0	4	4
General Zoology, Zool. 101	4	0	0
Economic Zoology, Zool. 102	0	4	0
Physical Geology, Geol. 120	0	0	4
U. S. History and Am. Govt., Hist. 121, 122 and Pol. Sc. 211	3	3	3
Elementary Wildlife Management, Zool. 111	1	0	0
*Military Science I, Mil. 101, 102, 103, or alternate	2	2	2
Fundamental Activities and Hygiene, P. E. 101, 102, 103	1	1	1
	18	21	21

Sophomore Year

COURSES	F	W	S
General Inorganic and Organic Chemistry, Chem. 201, 202, 203	5	5	5
Physics for Agric. Students and Comp. Anatomy, Physics 115 and Zool. 223	5	0	5
General Economics, Econ. 201, 202	3	3	0
Public Speaking and Business Correspondence, Eng. 231 and 211	3	3	0
Ornithology, Zool. 251, 252, 253	2	2	2
Surveying and Mapping I, C.E. 208, 209	0	4	4
*Military Science II, Mil. 201, 202, 203	2	2	2
Sports Activities, P.E. 201, 202, 203	1	1	1
	21	20	19

* On six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

Junior Year

COURSES	F	W	S
	Terms and Credits		
Dendrology, Bot. 211, 213	3	0	3
Plant Ecology, General Bacteriology, Bot. 441, Bot. 312	3	4	0
Animal Phys., Econ. Entom., Zool. 201, 213; Qual. Anal., Chem. 103	5	4	4
Wildlife Conservation, Zool. 321, 322, 323	3	3	3
General Field Crops, Prin. of Forestry, F.C. 101, For. 111	0	4	3
Land Economics, Plant Propagation, Agric. Econ. 212, Hort. 301	0	3	3
Social Science Elective	3	0	0
Electives	3	3	3
	20	21	19

Senior Year

Field Zoology, Adv. Animal Ecology, Zool. 431, 462, 463	3	3	3
Quan. Anal., Chem. 211; Soils, Soils 202; and Tech. Writing II, Eng. 323	4	5	3
Farm Equip., Agr. Eng. 202 and Aquat. Biology, Bot. 473	0	4	3
Wildlife Management, Zool. 451, 452, 453	3	3	3
Protozoology, Helminthology, Medical Entomology, Zool. 491, 492, 493	3	3	3
Electives	6	3	3
	19	21	18

THE AGRICULTURAL EXPERIMENT STATION

J. H. Hilton, Director

R. W. Cummings, Associate Director

Establishment.—The Agricultural Experiment Station was established in accordance with an Act of the General Assembly of 1877. Its progress has been enhanced by different Acts of Congress giving to the Station additional funds in 1887, 1906, 1925, and 1935. These are known as the Hatch, the Adams, the Purnell, and the Bankhead-Jones acts, respectively. The General Assembly has allocated to the Station annually certain funds from the general fund.

Purpose.—The purpose of the Agricultural Experiment Station is to study methods for economic production of the highest grades of livestock, poultry, and plants on the many soil types and varied conditions existing throughout the commonwealth; to study methods for the control of parasitic insects and organisms that cause serious economic losses of animals, poultry, and plants; to find and develop varieties of animals, poultry, and plants, new, and resistant to diseases and the changeable conditions prevailing in this State; and to perfect better marketing for all agricultural products.

Work.—The staff of the Agricultural Experiment Station conducts experiments throughout the State on areas owned by farmers, on six strategically located test farms, on farms rented for short periods, and in the greenhouses and laboratories of the College.

Research.—The agricultural research aims, through the discovery of new facts, to improve the well-being of farmers throughout the State; to strengthen the regulatory work of the State Department of Agriculture; to develop new and necessary facts for the teaching of sound agricultural principles by vocational agricultural instructors, agricultural extension agents, and agricultural instructors in the College.

Experts.—The Agricultural Experiment Station staff brings to the College many experts, whose teachings in many specialized fields of agriculture assure the maintenance of curricula of high standards. It contributes much to the advanced training of students who are destined to become the leaders, teachers, and investigators so necessary in the maintenance of agriculture on sound and economic planes.

Publications.—The Agricultural Experiment Station publishes many bulletins and scientific papers on results of research conducted by the staff. These are free and sent upon request of anyone in the State.

Problems.—The staff diagnoses and interprets many problems for the farmers of this State; holds council with farmers and others interested in the agricultural industry; discusses farming procedures over the radio, and writes many letters on the more specific problems of agriculture at the request of farmers, members of garden clubs, and of fertilizer, fungicide, and insecticide manufacturers. It takes part in many of the administrative functions of the College.

COOPERATIVE AGRICULTURAL EXTENSION WORK

Dr. I. O. Schaub, Director
John W. Goodman, Assistant Director
David S. Weaver, Assistant Director
Ruth Current, State Home Demonstration Agent
Verna Stanton, Assistant State Home Demonstration Agent

Support.—The Agricultural Extension Service of State College is conducted coöperatively with the United States Department of Agriculture and the one hundred counties of the State. The work is supported by Federal funds derived from the Smith-Lever Act of 1914, the Capper-Ketcham Act of 1928, the Bankhead-Jones Act of 1935, the Bankhead-Flannagan Act of 1945, and from State appropriations and county appropriations. The Federal and State appropriations are used to maintain an administrative and specialist staff, and to supplement salaries and travel expenses of county Extension agents.

Purpose.—The purpose of the Extension Service is to teach by demonstration. In carrying out this purpose, the College maintains a staff of trained specialists, a system of county agents and assistant agents, and a corps of home-demonstration agents. Instruction is given at group meetings by method and result demonstrations, and by the written word, by training leaders, and through organized effort with clubs of men, women, and young people. In all of these activities, the plan is to carry the rural people of North Carolina the latest and best information obtainable for building a more prosperous and satisfying life on the farm. The Extension Service holds a number of short courses, both on the College campus and elsewhere over the State, that the greatest number of rural leaders may be trained for building better homes and better farms, in the use of more efficient practices, thus creating a more satisfying way of life.

THE SCHOOL OF ENGINEERING

John Harold Lampe, Dean of the School of Engineering

L. L. Vaughan, Director of Instruction

The School of Engineering offers technical and engineering instruction, both graduate and undergraduate, to meet the needs of the people and the industries of North Carolina. Engineering Research, which is an important function in its operation, supplements and supports graduate study through fundamental researches and experimental investigations.

The organization of the School of Engineering for purposes of administration operates Line and Functional Departments as follows:

Line Departments

Architecture and Architectural Engineering.....Professor Ross Shumaker
Ceramic Engineering.....Professor W. W. Kriegel
Chemical Engineering.....Professor E. M. Schoenborn, Jr.
Civil Engineering.....Professor C. L. Mann
Electrical Engineering.....Professor C. G. Brennecke
General Engineering.....Professor G. Wallace Smith
Geological Engineering.....Professor J. L. Stuckey
Industrial Engineering.....*Associate Professor R. L. Wiggins
Mechanical Engineering.....Professor Karl P. Hanson

Functional Departments

Diesel and Internal Combustion Engines.....Professor R. B. Rice
Engineering Mechanics.....Professor G. Wallace Smith
Engineering Research.....Professor Wm. G. Van Note
Mathematics.....Professor H. A. Fisher
Physics.....*Professor J. S. Meares

Line Departments offer programs of study to graduate as well as undergraduate students, whereas Functional Departments conduct a program of graduate study and offer service courses to all departments of the College. All Department administrative officers are members of the Executive Committee of the School of Engineering.

All engineering instruction for the Consolidated University of North Carolina is given at North Carolina State College. The School of Engineering at Raleigh has an excellent staff and facilities. It is rapidly developing both in physical plant and modern progressive educational programs.

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* Acting Head.

The excellence of the instruction in the School of Engineering is attested by the fact that the Engineers' Council for Professional Development has accredited its curricula in Ceramic, Civil, Electrical, and Mechanical Engineering. It is the policy of the School of Engineering to have all of its curricula meet the standards of this nationally recognized accrediting agency.

Purpose

All of the undergraduate programs of study in the School of Engineering are so arranged that they contain broadening courses in the humanities while emphasizing the basic and fundamental engineering principles so essential to an engineering college program. Graduates of this new program will not only be prepared for engineering responsibilities and positions of trust in industry, but will have an appreciation and consciousness of human problems in community and industrial life.

The activities of the School of Engineering are devoted to undergraduate instruction, graduate instruction, and fundamental and applied research. These three major endeavors are being performed on the following plan of operation: (1) The concentration of our educational efforts in the major fields of engineering through the Bachelor of Engineering program. This four-year program provides education and training to meet the needs of from eighty to eighty-five per cent of the young men of our State who will take their places in industry and industrial life in the fields of production, sales, application, planning, and the operation of small industrial units. (2) The graduate activities are patterned to provide advanced specialized training and experimental experience to young men who have successfully completed a four-year program and who have an interest and ability to continue their education. This effective program will train approximately fifteen per cent of our graduates who are interested in more specialized endeavors, qualifying them for positions and activities in teaching, technical design, and research. (3) Our research activities are based on a program correlated with graduate study in engineering. It is the purpose of this program not only to train future research workers but also to carry out a program that assures both sound investigations of a fundamental nature in engineering sciences and work devoted to greater uses of the State's natural resources. Through publication, cooperative activity with industry, and the operation of our own investigational projects, it is intended that our engineering research activities will be a part of and work effectively with the industrial development of North Carolina.

Curricula

Revised engineering curricula became effective September, 1947, offering a modern four-year program leading to a Bachelor's degree patterned to serve the educational needs of the greater number of the young people of our State. A specialized fifth year of graduate study will provide advanced training for those interested and qualified for research, specialized design, or teaching. Under this program, which offers broadening studies in the humanities as well as basic and fundamental instruction in engineering, the minimum credit-hour requirement for graduation will be from 225 to 228 credit hours. Approximately, but not less than, 20 per cent of the credit hours will be devoted to a broadening and cultural correlated program of study. No changes will be made in the graduation requirements for the students now registered in the School of Engineering. The new program, therefore, will be fully effective for only those students who entered in September, 1947, or thereafter.

The new engineering curricula in the freshman year include a course in contemporary civilization of three credit hours each term, a total of nine credit hours. The freshman program also includes a three-credit hour course in English composition. No other course classified as humanities or social science will be offered in the first year's program. The twenty-four hours assigned to the upper three years in the humanistic program should be devoted to not fewer than two or more than three fields chosen from the following: American and foreign literature, economics, history and government, ethics and philosophy, and sociology. Thus, the forty-two credit hours devoted to the humanities will be divided with eighteen credit hours in the freshman year and twenty-four hours in the remaining three years, with not more than three hours in any one term. This humanistic program is definitely planned and integrated with an excellent four-year engineering course of instruction.

Admission; Advanced Standing.—Regulations for admission and for advanced standing are stated under Information for Applicants. (See Pages 30-34.)

The new curricula of the School of Engineering became effective September, 1947, for freshmen only. For students now registered in the School of Engineering the graduation requirements as to credit hours and courses are those shown in the College Catalog, Vol. 45, No. 8, April 1946, Catalog Issue 1945-46 with announcements for the session 1946-47. Courses from the new curricula may be substituted for certain required courses in the old curricula upon the approval of the department head and the Dean of Engineering.

Summer Work; Industrial Employment.—A minimum of six continuous weeks of gainful employment is a specific requirement for graduation in Engineering. This employment may be as laborer, sub-professional, or professional assistant in any of the following fields: (1) Industrial manufacture, repair service, or sales; (2) industrial, engineering or scientific research; (3) engineering or architectural design, and drafting; (4) engineering exploration, surveying, or reconnaissance; (5) construction of buildings, roads, railroads, dams, and other engineering works.

Students are required to consult with their department heads as to the type of work that will be acceptable before making arrangements for industrial employment. It is desirable that this employment be in the field of the student's scholastic major. The required industrial employment should be completed during a summer vacation period, which may be the one between the sophomore and junior years or the one between the junior and senior years, preferably the latter. Students enrolled for advanced military training should complete the industrial employment requirement between the sophomore and junior years to avoid conflict with ROTC Summer Camp.

The student is responsible for obtaining his employment and supplying satisfactory evidence thereof to the head of his department. This evidence will consist of a letter from the employer to the head of the student's department setting forth (1) inclusive dates of employment; (2) character of work performed; (3) type of operation of firm or individual; (4) an evaluation of the student's work. This letter must be submitted to the student's department head not later than the end of the Fall term of the year in which the student intends to graduate.

The requirement of Industrial Employment was waived during the war, but is reinstated for those students graduating in the Class of June, 1950, and for all subsequent classes.

Inspection Trips.—In order to familiarize himself with the practice of his profession, each senior in Engineering is required as a part of his curriculum to take the departmental inspection trips. None will be excused except for grave reasons.

These inspection trips are arranged by the Head of the Department in which the student takes his major work. The cost of such trips varies from $25.00 to $60.00 per student, depending on the time and distance traveled.

Degrees.—The four-year program in the new curricula will offer programs of study leading to a Bachelor's degree in Ceramic, Chemical, Civil, Electrical, Industrial, Geological, and Mechanical Engineering. Aeronautical Engineering will be an option in Mechanical Engineering.

A fifth year of correlated graduate study in specialized work leading to a Master's degree is offered in Ceramic, Chemical, Civil, Diesel, Electrical, Industrial, and Mechanical Engineering, and in Engineering Physics, Engineering Mechanics, and Engineering Mathematics. In many of the departments graduate students will have the opportunity of specializing in a narrow field of interest. For example, the Civil Engineering Department will offer programs of study in Construction Engineering, Sanitary Engineering, and Structural Engineering. Further details as to specialized fields of study are shown in this catalog under the heading of the engineering department concerned.

Programs of study in the School of Engineering are arranged to satisfy several different degrees. The degrees that may be conferred by the School of Engineering are:

Bachelor of a Specialized Branch of Engineering.—This is an earned undergraduate degree which includes in the last two years specialized courses in the particular branch of engineering in which the student is studying. The course is planned for four years of study. The graduation requirements are the satisfactory completion of all the required courses in one of the prescribed curricula (see tabulation of curricula on pages 104 to 130), total of not less than 225 to 228 term credits, and not less than 225 to 228 honor points ("C" average). A minimum of six continuous weeks of gainful employment is a further specific requirement for graduation in engineering.

Master of Science (M.S.) in a Specialized Branch of Engineering.—This is an earned graduate degree which can be obtained only after the Bachelor's degree. It requires at least one year of graduate work, a reading knowledge of at least one foreign language, and a thesis showing ability to pursue independent research. The core of graduate courses taken must emphasize a scientific objective. Further information concerning the requirements for this degree may be obtained by addressing Dr. Z. P. Metcalf, Director of Graduate Studies, State College, Raleigh, N. C.

Master of a Specialized Branch of Engineering.—This is an earned graduate degree which can be obtained only after the specialized Bachelor's degree and requires one year of graduate work which emphasizes the technical and specialized professional engineering courses, and a thesis showing experimental engineering ability. For further information concerning this degree, address Dr. Z. P. Metcalf, Director of Graduate Studies, State College, Raleigh, N. C.

The Honorary Degree of Doctor of Engineering (D.Eng.).—This degree is purely an honorary degree conferred upon men of extraordinarily high professional engineering attainments who are graduates of one of the branches of the University of North Carolina, or upon professional engineers who have rendered distinguished services to the State of North Carolina.

Short Courses; Institutes.—The School of Engineering cooperates with the College Extension Division in offering short courses and institutes for adults and graduate engineers. Such courses vary in length from one day to twelve weeks; each year the courses offered are different and vary according to the public demand. The faculty of the School of Engineering usually furnish a large portion of the instruction offered in these courses, which in the past have been for Electrical Metermen, Gas Plant Operators, Safety Engineers, Radio Engineers, Refrigeration and Air Conditioning Engineers, Waterworks Operators, Heating and Plumbing Contractors, and Surveyors. Classes are usually held in Raleigh where the School of Engineering has an excellent staff and adequate laboratories and classroom facilities available.

These short courses offer real opportunity to our practicing engineering personnel to follow a refresher program in their field of interest, as well as to become acquainted with the latest and most modern engineering procedures and equipment.

CURRICULA OFFERED IN THE SCHOOL OF ENGINEERING

Each of the following curricula is not only well balanced, but offers a liberal course of study in a technical and professional field. Each conforms to what is regarded by engineering educators as the best modern practice.

Freshman Year of All Engineering Curricula

COURSES	CREDITS First Term	Second Term	Third Term
Algebra, Trigonometry, Analytics, Math. 101, 2, 3	4	4	6
Composition, Eng. 101, 2, 3	3	3	3
General Inorganic Chemistry, Chem. 101, 2, 3	4	4	4*
Engineering Drawing, M.E. 101, 2, 3	2	2	2
Contemporary Civilization, C.C. 101, 2, 3	3	3	3
Military Science I, Mil. 101, 2, 3	2	2	2
Fund. Activities and Hygiene, P.E. 101, 2, 3	1	1	1
	19	19	21

* To become Qualitative Analysis September, 1948.

Students are admitted to the School of Engineering as engineering freshmen. These students are required to select their special field of engineering study (such as Civil or Mechanical Engineering, etc.) the first part of the spring term of their freshman year.

The new curricula of the School of Engineering became effective in September, 1947, for freshmen only. For students now registered in the School of Engineering the graduation requirements as to credit hours and courses are those shown in the College Catalog, Vol. 45, No. 8, April, 1946, Catalog issue 1945-46 with announcements for the session 1946-47. Courses from the new curricula may be substituted for certain required courses in the old curricula upon the approval of the department head and the Dean of Engineering.

The sophomore, junior, and senior programs of study in the various fields of Engineering are shown under the department headings on the pages that follow.

*ARCHITECTURE AND ARCHITECTURAL ENGINEERING

Professor Ross Shumaker, Head of Department
Professor J. D. Paulson
Associate Professors, James H. Grady, W. L. Baumgarten
Assistant Professors, Edward S. Pugh, Alexander Crane
Instructors: Robert H. Longstreet, Albert E. Bye, Arthur McKimmon,
Ranulph Bye, John S. Holloway, W. C. Correll

The courses in Architecture and Architectural Engineering have been arranged after careful study of the best curricula offered by the leading educational institutions in the United States. These studies and many years of practical experience on the part of the faculty—both in the profession and in teaching, enable this Department to offer two allied courses of merit, proved by the very high proportion of graduates of this Department who successfully follow the profession of architect.

The first three years of study in Architecture and in Architectural Engineering are very similar—so arranged that a student may transfer from one curriculum to the other until the end of the junior year—with a minimum loss of credits. After the third year, however, there is a wide divergence in the courses.

Architecture is one of the most valuable and constructive professions in modern civilization. While an art, it must be firmly rooted in science; and the greater the project, the more positively this is true. Consequently, a student who is ambitious to be a great architect must master the artistic scope of architecture and also such science as is pertinent. To compress such a course into four years would necessarily eliminate some essential studies or reduce the content of all. Therefore the curriculum in Architecture is presented as a five-year course of study.

Architectural Engineering is designed to prepare students for the pursuit of engineering as allied with architecture. Modern architecture has so many engineering aspects as in construction, fabrication and use of materials, provision of conveniences, that a student may well plan to specialize in some one of these fields. This four-year course provides a thorough training in the theoretical engineering of architecture and a sufficient knowledge of architecture as an art to enable the graduate to pursue any specialized branch he may select. Also it is possible for him to continue in the field of architecture and eventually obtain registration as a licensed architect.

* It is expected that in the near future Administrative action will transfer the activities of this department to the School of Architecture and Landscape Design. This new school will be activated as soon as budget, staff, and space requirements are available.

CURRICULUM IN ARCHITECTURAL ENGINEERING

For the Freshman Year, refer to page 104.

Surveying, C.E. s200, 3 credits, is required in the summer immediately following the freshman year.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
*Business English, Public Speaking, Eng. 211, 231, and Elective English	3	3	3
Physics for Engineers, Phys. 201, 202, 203	4	4	4
Engineering Mechanics, E.M. 311, 312	0	3	3
Elements of Architecture I, II, III, Arch. 201, 202, 203	3	3	3
Shades and Shadows, Arch. 205	2	0	0
Pencil Sketching, Arch. 100abc	1	1	1
Perspective Drawing, Arch. 206	1	0	0
Military Science II, Mil. 201, 202, 203 (or elective†)	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
Sophomore Year	21	21	21

Junior Year

Engineering Mechanics, E.M. 313	3	0	0
Strength of Materials, E.M. 321, 322	0	3	3
Materials Testing Laboratory, C.E. 322	0	1	0
Materials of Construction, C.E. 321	0	0	3
Sanitary and Mech. Equipment of Buildings, C.E. 365, 366	3	3	0
General Economics, Econ. 201, 202, 203	3	3	3
Freehand Drawing 1, 2, 3, Arch. 101, 102, 103	2	2	2
Intermediate Design B-1, B-2, B-3, Arch. 301, 302, 303	3	3	3
History of Architecture 1, 2, 3, Arch. 321, 322, 323	3	3	3
**Electives	3	3	3
Junior Year	20	21	20

Summer Requirements: Six Weeks Industrial Employment.

Senior Year

Reinforced Concrete, C.E. 421, 422	3	3	0
Graphic Statics, C.E. 423, 424, 425	1	1	1
Theory of Structures, C.E. 431a, 432a	3	3	0
Photographic Practice, Arch. 304	0	0	1
Specifications, Arch. 416	0	0	3
Building Materials I, Arch. 409	3	0	0
Electrical Equipment of Buildings, E.E. 343	0	0	3
Business Law, Econ. 307	3	0	0
Architectural Design, E-1, E-2, Arch. 351, 352	3	3	0
Architectural Office Practice, Arch. 411, 412	0	3	3
Architectural Estimates, Arch. 408	0	0	2
Structural Design, C.E. 426, 427	0	3	3
**Electives	3	3	3
Senior Year	19	19	19

Total credits required for completion of course: 241. Degree: Bachelor of Architectural Engineering.

All seniors will be required to go on the inspection trip as part of their curriculum.

* Students who have been certified by the Department of English as proficient in English may substitute for the course listed French, M.L. 101.

† Or six credits in one or two of the following Departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology.

** To be selected from the following fields: Humanities, Military Science III and IV, Language and Literature, Pure Mathematics, Pure Natural Science, and Social Science.

CURRICULUM IN ARCHITECTURE

Freshman or First Year

COURSES	CREDITS First Term	Second Term	Third Term
Mathematics 101, 102, 103	4	4	6
Composition, Eng. 101, 102, 103	3	3	3
French, or Modern Language, M.L. 101, 102, 201, or Equiv.	3	3	3
Pencil Sketching, Arch. 100abc	1	1	1
World History, Hist., 111, 112, 113	2	2	2
Architectural Drawing, Arch. 107ab (or M.E. Equivalent)	3	3	0
Descriptive Geometry, M.E. 107	0	0	3
Military Science I, Mil. 101, 102, 103 (or elective†)	2	2	2
Fundamental Activities and Hygiene, P.E. 101, 102, 103	1	1	1
Freshman or First Year	19	19	21

Summer Requirements: Surveying, C.E. s200, 3 credits.

Sophomore or Second Year

COURSES	First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Background for Modern Thought (or Elective)	3	3	3
Physics for Engineers, Phys. 201, 202	4	4	0
Shades and Shadows, Arch. 205	2	0	0
Engineering Mechanics, E. M. 311, 312	0	3	3
Elements of Architecture I, II, III, Arch. 201, 202, 203	3	3	3
History of Sculpture and Mural Decoration, Arch. 325	0	0	2
Working Drawings, Arch. 305	0	0	2
Perspective Drawing, Arch. 206	1	0	0
Military Science II, Mil. 201, 202, 203 (or elective†)	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
Sophomore or Second Year	20	20	20

Junior or Third Year

COURSES	First Term	Second Term	Third Term
Business English, Pub. Speaking, Eng. 211, 231, and Elective English (or M.L.)	3	3	3
Strength of Materials, E.M. 321, 322	0	3	3
Materials Testing Laboratory, C.E. 322	0	1	0
Materials of Construction, C.E. 321	3	0	0
Sanitary and Mech. Equip. of Buildings, C.E. 365	3	0	0
Freehand Drawing 1, 2, 3, Arch. 101, 102, 103	2	2	2
Architectural Office Practice, Arch. 411, 412	0	3	3
Intermediate Design B-1, B-2, B-3, Arch. 301, 302, 303	3	3	3
History of Architecture 1, 2, 3, Arch. 321, 322, 323	3	3	3
**Electives	3	3	3
Junior or Third Year	20	21	20

Summer Requirements: Six Weeks Industrial Employment.

Senior or Fourth Year

COURSES	First Term	Second Term	Third Term
General Economics, Econ. 201, 202, 203	3	3	3
Reinforced Concrete, C.E. 421, 422	3	3	0
Graphic Statics, C.E. 423, 424, 425	1	1	1
Electrical Equipment of Buildings, E.E. 343	0	0	3
Architectural Design B-4, B-5, B-6, Arch. 353, 354, 355	6	6	6
History of Architecture 4, Arch. 421	0	3	0
Building Materials I, Arch. 409	3	0	0
Professional Practice, Arch. 414	0	0	1
Clay Modeling, Arch. 114 abc	1	1	1
Photographic Practice, Arch. 304	0	0	1
**Electives	3	3	3
Senior or Fourth Year	20	20	19

† Or six credits in one or two of the following Departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology.

** To be selected from the following fields: Humanities, Military Science III and IV, Language and Literature, Pure Mathematics, Pure Natural Science, and Social Science.

Professional or Fifth Year

COURSES	CREDITS First Term	Second Term	Third Term
Business Law, Econ. 307	3	0	0
Specifications, Arch. 416	0	0	3
Theory of Structures, C.E. 431a, 432a	3	3	0
Architectural Design A-1, A-2, A-3, Arch. 401, 402, 403	6	6	6
Freehand Drawing 4, 5, 6, Arch. 211, 212, 213	3	3	3
Architectural Composition, Arch. 407	2	0	0
City Planning, Arch. 415	0	2	0
Architectural Estimates, Arch. 408	0	0	2
**Electives	3	6	6
Fifth Year	20	20	20

Total Credits: 302. Completion of the course to be recognized by granting the degree of Bachelor of Architecture.

CERAMIC ENGINEERING

Professor W. W. Kriegel, Head of the Department

Instructors C. V. Rue, W. C. Hackler

Ceramic Engineering includes those phases of engineering which have to do with the study of the nonmetallic minerals, except fuels and ores as such, and the manufacture of products therefrom. The nonmetallic minerals compose over 90 per cent of the earth's surface, and the industries based on them rank above the automobile, and the iron and steel industries, in value of product. Principal among these products are those made of clay and associated minerals, such as building brick, hollow tile, sewer pipe, refractories, wall and floor tile, tableware, pottery, electrical porcelain, chemical and sanitary stoneware, flat glass, chemical and table glassware, enameled iron and steel, portland and hydraulic cements, and limes.

The demand for ceramic engineers has far exceeded the supply for a number of years past. It is with the idea of supplying this demand and developing the latent resources of North Carolina that a four-year curriculum in Ceramic Engineering, leading to the degree of Bachelor of Ceramic Engineering, is offered.

The Ceramic Engineering courses consist of the theoretical and practical study of the mining, manufacturing, and testing of ceramic materials and products as well as the design of ceramic equipment and plants.

Graduates in Ceramic Engineering are employed in the ceramic industries as plant executives, research engineers, plant-control engineers, sales engineers, product-control engineers, plant designers and constructors, teachers, and technologists. Graduates of the Department are successfully holding positions in all of these fields.

CURRICULUM IN CERAMIC ENGINEERING

For the Freshman Year, refer to page 104.

COURSES	CREDITS First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Quantitative Analysis, Chem. 212	4	0	0
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Physical Geology, Geol. 120	4	0	0
Humanities	0	3	3
Ceramic Materials, Cer. E. 202	0	3	0
Nonmetals mining and benefication, Cer. E. 205	0	0	3
†Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
	20	18	18

† Or six credits in one or two of the following Departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology.

Junior Year

COURSES	CREDITS First Term	Second Term	Third Term
Engineering Mechanics, E.M. 311, 312, 313	3	3	3
Humanities	3	3	3
Drying Fundamentals and Practice, Cer. E. 301	3	0	0
Firing Fundamentals and Practice, Cer. E. 302	0	3	0
Ceramic Calculations, Cer. E. 303	0	0	3
Ceramic Processes, Cer. E. 308, 309	0	2	2
Engineering Thermodynamics, M.E. 307, 308	3	3	0
Mechanical Engineering Laboratory I, M.E. 313, 314	1	1	0
Mineralogy, Geol. 230	3	0	0
Physical Chemistry, Chem. 331	0	0	5
Electives	3	3	3
	19	18	19

† Summer requirement: Six weeks industrial employment.

Senior Year

Silicates, I, II and III, Cer. E. 403, 404, 405	3	3	3
Ceramic Laboratory, Cer. E. 411, 412, 413	3	3	3
Ceramic Designing, Cer. E. 414, 415	0	3	3
Pyrometry, Cer. E. 401	1	0	0
Public Speaking, Eng. 211	3	0	0
Elements of Electrical Engineering I, E.E. 320, 321	0	4	4
Strength of Materials, E. M. 321	3	0	0
Humanities	3	3	3
Electives	3	3	3
	19	19	19

All seniors are required to go on a plant inspection trip as one of the requirements for a degree.

GRADUATE STUDY IN CERAMIC ENGINEERING

Graduate work in Ceramic Engineering is offered leading to either the Master of Science in Ceramic Engineering or the Master of Ceramic Engineering degrees. General instructions and requirements for the Master of Science degree are contained in the publications of the Graduate School. The curriculum for the degree of Master of Ceramic Engineering is shown below.

Master of Ceramic Engineering

COURSES	CREDITS First Term	Second Term	Third Term
Differential Equations, Math. 431 B	3	0	0
Optical Mineralogy, Geol. 431, 432, 433	3	3	3
*Silicates IV, V and VI, Cer. E. 521, 522, 523	3	3	3
Advanced Ceramic Designing, Cer. E. 503	0	0	3
Industrial Adapt. of Ceramic Materials, Cer. E. 518	0	3	0
Advanced Physical Chemistry, Chem. 491, 492, 493	3	3	3
Ceramic Seminar, Cer. E. 531, 532, 533	1	1	1
Electives	3	3	3
	16	16	16

* Subject matter to cover phases of ceramics in which the student wishes to specialize.
† Waived for students graduating prior to 1950. See page 102.

CHEMICAL ENGINEERING

Professor E. M. Schoenborn, Head of the Department
Associate Professors K. O. Beatty, Jr., R. Bright, F. P. Pike
Assistant Professor J. F. Seely
Instructors D. S. Arnold, H. C. Claflin, E. B. Finch

Chemical engineering is concerned with the development and application of manufacturing and allied processes in which chemical or certain physical changes of material are involved. It involves the application of mathematics, chemistry, physics and fundamental engineering principles to the design, construction, operation, control and improvement of equipment for carrying out chemical processes on an industrial scale at the lowest possible cost. Most of the so-called process industries—the production of chemicals, plastics, rubber, paints, synthetic fibers, petroleum, paper, explosives, drugs, food, soap, magnesium, aluminum, glass, cement and numerous others—are inherently chemical engineering in nature. To prepare men for careers in industries of these kinds is the purpose of the course in chemical engineering.

The work of the chemical engineer is so extensive and diversified in scope that his training must be along broad and basic lines rather than in any one field of specialization. Furthermore, the spirit of research and experimentation is vital to the chemical industry so that the development not only of a sound technical background but of a capacity for original thought and independent accomplishment is an essential part of his program. The undergraduate curriculum emphasizes the engineering, the chemical and the economic principles involved in chemical processes and operations. The work in chemistry including inorganic, analytical, physical and organic chemistry is comparable to that usually given to chemists in the first three years with the exception of a reduction of time devoted to laboratory work. The subjects in mechanical and electrical engineering, in mechanics and metallurgy are designed to supply the fundamentals of these branches. The work in the chemical engineeering subjects although distinctly professional in application is nevertheless basic in character. Since it depends upon a thorough background in the sciences it is postponed until the third and fourth years. It is designed to develop in the student initiative, sound habits of thought and intellectual curiosity.

The Chemical Engineering Laboratories are provided with pilot plant-type equipment for studying the principles of fluid flow, heat transfer, distillation, absorption, drying, crushing and grinding, filtration, agitation, etc. Much new equipment has been installed and new and special apparatus is added from time to time to keep the facilities abreast of recent developments in the field. Special equipment for research and instructional purposes are designed and built in the department laboratories. In this way students are given first hand acquaintance with problems relating to the actual design, construction and operation of typical types of equipment used in industry.

Opportunities for employment in the chemical and allied industries upon graduation are numerous and varied. Graduates find employment in such fields as: research and development; production, operation and maintenance; management and administration; inspection, testing and process control; technical service and sales; estimation and specification writing; consulting and teaching, and many others. Students desiring to pursue careers in research and development or in teaching and consulting work are strongly advised to consider graduate training. In fact the need for persons having had advanced training in the field beyond the regular four-year program is continually increasing.

CURRICULUM IN CHEMICAL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

	CREDITS		
COURSES	First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Quantitative Analysis, Chem. 211, 212, 213	3	3	3
Chemical Process Principles I, Ch.E. 205	0	0	3
Humanities	3	3	0
Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
	18	18	18

Junior Year

Engineering Mechanics, E. M. 311, 312, 313	3	3	3
Organic Chemistry, Chem. 421, 422	4	4	0
Physical Chemistry, Chem. 431, 432	4	4	0
Chemical Process Principles II, III, Ch.E. 311, 312	3	3	0
Unit Operations I, Ch.E. 313	0	0	3
Chemical Engineering Thermodynamics I, Ch.E. 315	0	0	3
Metallurgy, M.E.	0	0	3
Humanities	3	3	3
Electives	3	3	3
	20	20	18

† Summer requirement: Six week's industrial employment.

Senior Year

Unit Operations II, III, Ch.E. 411, 412	3	3	0
Unit Operations Laboratory, Ch.E. 431, 432, 433	3	3	3
Chemical Engineering Thermodynamics II, Ch.E. 415	3	0	0
Strength of Materials, E.M. 321	3	0	0
Elements of Electrical Engineering E.E.	0	4	4
Chemical Engineering Projects, Ch.E. 472, 473	0	3	3
Mathematics for Chemical Engineers, Math.	0	0	2
Process Engineering, Ch.E. 427	0	0	2
Humanities	3	3	3
Electives	3	3	3
	18	19	20

† Waived for students graduating prior to 1950. See page 102.

GRADUATE STUDY IN CHEMICAL ENGINEERING

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Chemical Engineering leading to the degree of M. S. in Ch. E. or to the M. Ch. E. To qualify for the latter degree, the following curriculum may be followed.

CURRICULUM IN CHEMICAL ENGINEERING

Fifth Year

COURSES	CREDITS First Term	Second Term	Third Term
Heat Transfer, Diffusional Operations, and Distillation or Drying, Ch.E. 511, 512, and 513 or 514	3	3	3
Chemical Engineering Seminar, Ch.E. 561, 562, 563	1	1	1
Chemical Engineering Projects, Ch.E. 571, 572, 573	2	2	2
Differential Equations, Math.	3	0	0
Materials Laboratory, C.E.	3	0	0
Equipment and Plant Design, Ch.E. 531, 532	0	3	3
Adv. Physical or Organic Chemistry, Chem.	0	3	3
Electives	3	3	3
	15	15	15

CIVIL ENGINEERING

Professor C. L. Mann, Head of the Department
Professor C. R. Bramer
Associate Professors W. F. Babcock, H. E. Griset, A. E. Williamson, Jr.
Assistant Professor C. M. Lambe
Instructors W. W. Boyer, E. I. Brown, H. T. Chapin, Jr., F. F. Funk, H. L. Kingsbury, Jr., J. O. Litchford, L. R. Mann, G. Palevsky, W. H. Semple

The Department of Civil Engineering is located in the Civil Engineering Building in which the offices, classrooms, laboratories, and instrument rooms were designed and built to provide suitable facilities for efficient teaching and laboratory instruction.

Civil Engineering is the oldest and most general of all the branches of modern engineering; in fact, from it all of the others have developed. The usefulness of Civil Engineering is so well recognized that a student who does not have a strong predilection for some other special branch may be safely advised to study Civil Engineering.

The Civil Engineering curriculum in the School of Engineering has been accredited by the Engineers' Council for Professional Development. It is a well-balanced course of study, upon the completion of which the graduate is equipped to assume the duties of junior engineer in any of the following important fields: design, construction, operation, or testing of water-power developments, railroads, highways, airways, water supplies, sewerage systems.

The Civil Engineering Department offers a four-year curriculum leading to a Bachelor's degree in engineering. The Department also offers a fifth-year professional curriculum leading to a Master's degree in Civil Engineering. This fifth-year work, following the satisfactory completion of the work required for a Bachelor's degree, may be taken in one of the following specialized fields: construction, sanitary, structural, or transporation. A complete curriculum is offered for each of the four courses of study.

CURRICULUM IN CIVIL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Humanities	0	3	3
Descriptive Geometry, M.E. 201	2	0	0
Surveying, C.E. 211, 212, 213	4	4	3
Physical Education, P.E. 201, 202, 203	1	1	1
Military Science II, Mil. Sci. 201, 202, 203	2	2	2
	18	19	18

Junior Year

Engineering Mechanics, E.M. 311, 312, 313	3	3	3
Strength of Materials, E.M. 321	0	0	3
Elements of Electrical Engineering, E.E. 320, 321	3	3	0
Electrical Engineering Laboratory II, E.E. 325, 326	1	1	0
Physical Geology, Geol. 120	4	0	0
Engineering Thermodynamics, M.E. 307	0	0	3
Mechanical Engineering Laboratory I, M.E. 313	0	0	1
Materials Testing Laboratory, C.E. 312, 313	0	2	2
Transportation Engineering, C.E. 371, 372, 373	3	3	3
Humanities	3	3	3
Military Science III or Electives	3	3	3
	20	18	21

† Summer Requirement: Six weeks' industrial employment.

Senior Year

Strength of Materials, E.M. 422	3	0	0
Fluid Mechanics, E.M. 430	4	0	0
Hydraulics, C.E. 484	0	4	0
Hydrology and Drainage, C.E. 487	0	0	3
Water Works, C.E. 493	0	0	3
Theory of Structures, C.E. 437	5	0	0
Structural Design, C.E. 428, 429	0	5	5
Materials Testing Laboratory, C.E. 401	2	0	0
Soil Mechanics and Foundations, C.E. 442	0	3	0
Humanities	3	3	3
Military Science IV or Electives	3	3	3
	20	18	17

† Waived for students graduating prior to 1950. See page 102.

FIFTH-YEAR CURRICULA IN CIVIL ENGINEERING

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Civil Engineering leading to the degree of M.S. in C.E. or to the M.C.E. To qualify for the latter degree, either of the following curricula may be followed:

CONSTRUCTION ENGINEERING

COURSES	CREDITS First Term	Second Term	Third Term
Construction Methods and Equipment, C.E. 561, 562, 563	3	3	3
Construction Planning, Estimates and Costs, C.E. 565, 566, 567	3	3	3
Management of Labor Relations, Econ. 431, 432, 433	3	3	3
Building Materials, Architectural Office Practice, Architectural Specifications, Arch. 409, 411, 416	3	3	3
Civil Engineering Seminar, C.E. 551, 552, 553	1	1	1
Engineering Elective*	3	3	3
	16	16	16

SANITARY ENGINEERING

Water Purification and Sewerage, C.E. 495, 496	3	3	0
Sewage and Waste Treatment, C.E. 497	3	0	0
Sanitary Examinations and Analyses, C.E. 591, 592	2	2	0
Sanitary Works Design, C.E. 593	0	0	2
Civil Engineering Seminar, C.E. 551, 552, 553	1	1	1
Sanitary Engineering Research, C.E. 581, 582, 583	3	3	3
Advanced Bacteriology, Aquatic Biology, Bot. 452, 473	0	3	3
Engineering Elective or Statistics*	3	3	3
	15	15	12
Choice of one course from:			
Public Finance and Taxation, Econ. 416	0	3	0
Dairy Products I, D.M. 411	3	0	0
Engineering Contracts and Specifications, C.E. 483	0	0	3

STRUCTURAL ENGINEERING

Differential Equations, Advanced Mathematics for Engineers, Series for Engineers, Math. 401a, 412, 413	3	3	3
Advanced Structural Theory and Experimental Stress Analyses, C.E. 531, 532, 533	3	3	3
Advanced Structural Design, C.E. 525, 526, 527	3	3	3
(or Advanced Structural Design and Advanced Soil Mechanics, C.E. 525, 542, 543)			
Advanced Strength of Materials, Applied Elasticity, Vibration Problems, E.M. 451, 502, 454	3	3	3
Civil Engineering Seminar, C.E. 551, 552, 553	1	1	1
Engineering Elective*	3	3	3
	16	16	16

TRANSPORTATION ENGINEERING

Economics of Transportation, Econ. 421, 422, 423	3	3	3
Advanced Strength of Materials, E.M. 451	3	0	0
Transportation Design, C.E. 571, 572, 573	3	3	3
Highway Engineering, C.E. 577	0	0	3
Traffic Engineering, C.E. 578, 579	0	3	3
Soil Stabilization and Advanced Soil Mechanics, C.E. 541, 542	3	3	0
Civil Engineering Seminar, C.E. 551, 552, 553	1	1	1
Engineering Elective or Statistics*	3	3	3
	16	16	16

* The elective gamut must all be taken in one department or must comprise a related sequence of work if chosen from several departments.

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor C. G. Brennecke, Head of the Department
Professor Emeritus William Hand Browne, Jr.

Professors G. B. Hoadley, R. S. Fouraker, J. E. Lear; Associate Professors K. B. Glenn, W. D. Stevenson, Jr.; Assistant Professors W. S. Carley, R. J. Pearsall, J. H. Sherman, Jr., E. W. Winkler; Instructors R. P. Cocke, Jr. W. E. Estelle, E. G. Manning, A. B. MacIntyre, F. R. Willard.

Purpose.—The purpose of the undergraduate curriculum is to train young men for active work in a wide and diversified field. The electrical industry demands, above all else, a thorough preparation in the sciences underlying all branches of engineering, a broad foundation in fundamental electrical theory, and a clear understanding of the characteristics of electrical machinery and systems. These factors are essential for success, whether it be in the design and manufacture of electrical equipment, in power production and utilization, or the fields of communication and electronics, since in all these branches of the industry technical advances are being made with increasing rapidity. With this object in view, the curriculum in Electrical Engineering includes comprehensive training in mathematics and physics—the fundamental sciences—and adequate training in allied branches of engineering. All courses are accompanied by coordinated work in the laboratory and intensive drill in the application of theory by means of carefully planned problems. In the senior year, the student is offered a choice between two two-course sequences, one in Power and the other in Communications.

The curriculum includes a thorough drill in the preparation and delivery of technical reports.

Each student is required to spend at least six weeks in satisfactory industrial employment before receiving his degree, and to take the Senior Spring Inspection trip during his last year in residence.

Departmental Student Activities.—Close coordination with the work of the American Institute of Electrical Engineers is effected through a student branch at the College, which meets twice a month, through the State Section of the Institute, which meets several times during the year, and through the regional meetings of the Institute, one section of which is organized as a student-activities conference.

An active chapter of Eta Kappa Nu, the national honorary Electrical Engineering fraternity, maintains its Chapter room in Daniels Hall, adjoining the laboratory of the N. C. State College Radio Club. Both of these organizations are closely associated with the work of the Department. There is a recently organized student branch of the Institute of Radio Engineers.

Buildings and Equipment.—The Department is housed in Daniels Hall. It maintains the following laboratories: Dynamo, Communications and Electronics, Industrial Electronics and Control, Measurements, Standards, and Photometry. In addition, there are an instrument room, a shop, and several research rooms. The Dynamo Laboratory occupies the wing of Daniels Hall; all the others are in the main part of the building.

All of these laboratories have been recently renovated and re-equipped.

CURRICULUM IN ELECTRICAL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Physics 201, 202, 203	5	5	5
Selected Sequence in Humanities	3	3	3
Electrical Design, M.E. 219	3	0	0
Electrical Engineering Fundamentals, E.E. 201, 202	0	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities P.E. 201, 202, 203	1	1	1
	18	18	18

Junior Year

Engineering Mechanics, E.M. 311, 312, 313	3	3	3
Engineering Thermodynamics, M.E. 307, 308, 309	3	3	3
Mechanical Engineering Laboratory I, M.E. 313	0	0	1
Differential Equations, Math. 401a	3	0	0
Selected Sequence in Humanities	0	3	3
Alternating Current Circuits and Lines, EE 301, 302, 303	3	3	3
Direct Current Machinery, E.E. 305	3	0	0
Dynamo Laboratory, E.E. 311, 312	1	1	0
Fundamentals of Electronics, E.E. 415a, 416a	0	3	3
Electronics Laboratory I, E.E. 416b	0	0	1
Electrical Measurements E.E. 317, 318	1	1	0
**Electives	3	3	3
	20	20	20

Summer requirement: Six weeks industrial employment.

Senior Year

Strength of Materials, E.M. 321	3	0	0
Fluid Mechanics, E.M. 330	0	0	3
Technical Writing, Eng. 321	0	3	0
Selected Sequence in Humanities	3	3	3
Electronics Laboratory II, E.E. 416b	1	0	0
Alternating Current Machinery, E.E. 401, 402	3	3	0
Electrical Transients, E.E. 405	3	0	0
Electromagnetic Fields, E.E. 407	0	3	0
Advanced Dynamo Laboratory, E.E. 411, 412, 413	1	1	1
Central Stations, E.E. 424	0	0	3
Electrical Engineering Pro-Seminar, E.E. 445, 446, 447	1	1	1
***Departmental Electives	0	3	3
**Electives	3	3	3
	18	20	17

* Or 6 credits in one or two of the following Departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology.

** The Junior and Senior Electives may be taken in advanced Military Science. If not, they are to be made up as follows: 12 hours chosen from E.E. 403(3); E.E. 417(3); E.E. 422(3); E.E. 437(3); Math. 411(3); Math. 412(3); and 6 hours chosen from Eco. 307(3); Engl. 231(3); Stat. 411(3).

*** For these 6 hours, students may choose either the sequence E.E. 425, 426 (Electric Communication) or the two courses E.E. 403 (Electrical Transmission) and E.E. 422 (Power Applications).

GRADUATE STUDY IN ELECTRICAL ENGINEERING

For general regulations, the announcement of the Graduate School in this Catalog should be consulted. Graduate work is offered in Electrical Engineering leading to the degree of M.S. in E.E., or to the M.E.E. To qualify for the latter degree, either of the following curricula may be followed.

Fifth Year Curriculum in Communications and Electronics

COURSES	CREDITS First Term	Second Term	Third Term
Ordinary and Partial Diff. Equations, Math. 501a	3	0	0
Complex Variable Theory, Math. 511	0	3	0
Operational Mathematics, Math. 512, 513	0	3	3
Modern Physics, Phys. 407	0	0	3
Vibration and Wave Motion, Applied Acoustics, Phys. 412, 413	0	3	3
Industrial Electronics and Control, E.E. 417	3	0	0
Electrical Engineering Seminar, E.E. 505, 506, 507	1	1	1
Communication Networks, E.E. 511, 512, 513	3	3	3
Microwave Electronics, E.E. 515	4	0	0
Wave Guides and Cavities, E.E. 519, 520	3	4	0
Radiation and Antennas, E.E. 525	0	0	4
Project Work in E.E. 540, 541, 542	1	1	1
	18	18	18

Fifth Year Curriculum in Electric Power

COURSES	First Term	Second Term	Third Term
Ordinary and Partial Diff. Equations, Math. 501a	3	0	0
Complex Variable Theory, Math. 511	0	3	0
Operational Mathematics, Math. 512	0	0	3
Hydraulic Machinery, E.M. 431	3	0	0
Industrial Electronics and Control, E.E. 417	3	0	0
Illumination, E.E. 437	0	0	3
Electrical Engineering Seminar, E.E. 505, 506, 507	1	1	1
Power System Stability, E.E. 508	0	3	0
Advanced Alternating Current Machinery, E.E. 509	0	0	4
Transmission Line Transients, E.E. 510	0	4	0
Servomechanisms, E.E. 527	4	0	0
High Voltage Engineering, E.E. 535	0	0	3
Dielectrics and Insulating Materials, E.E. 536	0	3	0
Power Networks and Relaying E.E. 537, 538, 539	3	3	3
Project Work in E.E., E.E. 540, 541, 542	1	1	1
	18	18	18

GEOLOGICAL ENGINEERING

Professor Jasper L. Stuckey, Head of the Department
Associate Professor, John M. Parker, III
Assistant Professor, E. L. Miller, Jr.
Instructors Edward L. Holt, William C. Hayes

Function and Facilities.—The function of the Department of Geology is twofold: first, to offer service courses required as prerequisites in the Agricultural, Educational, and Engineering curricula; second, to administer the curriculum in Geological Engineering.

The Curriculum is designed to train young men in the fundamentals of engineering and the special applications of geology. Many major engineering undertakings, such as construction of large dams and reservoirs, tunnels, and large buildings, depend for success on the exact knowledge of their geological setting. On the other hand, such geological problems as the economical development of mineral resources require the use of the precise methods of engineering. The curriculum combines these two types of information and training so necessary to success in this important specialized field.

Professional Outlook.—A graduate of this curriculum may follow one of two broad fields of engineering either in the United States or in foreign countries; one, the application of geology to engineering work, and the other the application of geology in the mineral industries. Geological engineers are in demand by oil and mining companies, engineering construction companies, municipalities, various public utilities, state and federal governmental agencies, and by schools, colleges, museums, and research institutes.

The southeast offers tremendous possibilities to geological engineers. There is a growing need for the application of geological science to engineering construction in connection with foundations, excavations, and in water supply problems. In the region are deposits, only partially developed, of iron, coal, phosphates, mica, feldspar, spodumene, copper, nickel, kaolin, cyanite, sillimanite, barite, granite, limestone, talc, pyrophyllite, marls, and other minerals.

A fifth year of more specialized study, based on the fundamentals of the undergraduate curriculum, is available for those who desire advanced training in this field.

CURRICULUM IN GEOLOGICAL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Humanities	3	0	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Quantitative Analysis, Chem. 212	0	4	0
Physical Geology, Geol. 120	4	0	0
Historical Geology, Geol. 222	0	4	0
Mineralogy, Geol. 230	0	0	3
Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
	19	20	18

Junior Year

Humanities	3	3	3
Engineering Mechanics, E.M. 311, 312, 313	3	3	3
Surveying, C.E. 211, 212	4	4	0
Elements of Electrical Engr., E.E. 320, 321	0	3	3
Elements of Electrical Engr., Lab. E.E. 325, 326	0	1	1
Strength of Materials, E.M. 321	0	0	3
Advanced Mineralogy, Geol. 332	0	2	0
Petrology, Geol. 443	0	0	4
Structural Geol., Geol. 351	4	0	0
Electives	3	3	3
	17	19	20

† Summer Requirement: Six weeks' industrial employment.

Senior Year

Humanities	3	3	3
Technical Writing I, Eng. 321	0	3	0
Engineering Thermo. M.E. 307	3	0	0
Mechanical Engineering Lab. M. E. 313	1	0	0
Fluid Mechanics, E.M. 330	0	0	3
Geological Surveying, Geol. 463	0	0	4
Economic Geology, Geol. 412, 413	0	4	4
Engineering Geology, Geol. 462	0	3	0
Mining Methods, Geol. 470	4	0	0
Optical Mineralogy, Geol. 431, 432, 433	3	3	3
Electives	3	3	3
	17	19	20

† Waived for students graduating prior to 1950. See page 102.

Graduate Study in Geological Engineering

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Geological Engineering leading to the degree of M. S. in G. E. or to the M.G.E. To qualify for the latter degree, the following curriculum may be followed.

Fifth Year Curriculum in Geological Engineering

COURSES	CREDITS First Term	Second Term	Third Term
Sedimentation, Geol. 551	3	0	0
Stratigraphy and Index Fossils, Geol. 552	0	3	0
Petroleum Geology, Geol. 515	0	0	3
Geophysics, Geol. 553, 554	0	3	3
Advanced Economic Geology, Geol. 511, 512	3	3	0
Mining and Mineral Dressing, Geol. 471, 472, 473	3	3	3
Microscopic Determination of Opaque Minerals, Geol. 533	0	0	3
Geomorphology, Geol. 480	3	0	0
Seminar, Geol. 581, 582, 583	1	1	1
	13	13	13

An additional 15 credits shall be required of which 12 shall be selected from two of three fields, Physics, Chemistry, and Engineering. An Advisory committee from the Department of Geology and representatives of the department concerned shall approve the courses selected.

During his fifth year each student will do specialized work under supervision in one of the fields listed below and prepare a thesis based on his course work and the published literature on an approved topic in this field.

The specialized fields are:

Non-metallic mineral deposits (except petroleum)
Petroleum geology and production
Metallic mineral deposits
Engineering Geology
Mining and mineral dressing

INDUSTRIAL ENGINEERING

Professor D. E. Henderson, Head of the Department
Visiting Professor C. D. Hart
Instructor R. W. Llewellyn
Fellow D. O. Garrison

Industrial Engineering includes time and motion analysis for work simplification and standardization, control of quality and quantity of production through modern mass production methods, establishment of cost standards and reduction of costs through improved methods of manufacture, and technical aspects of personnel management in such activities as job evaluation and wage incentive programs. The remarkable progress made in these branches of industrial engineering during World War II is being increasingly realized by industrial enterprises. The result has been that the demand for industrial engineering graduates has been accelerated.

North Carolina has many types of manufacture in which industrial engineers may be profitably employed. Greater efficiency in operations as well as the expansion of industrial activities in the State will maintain the need for graduates in this ever-developing field. Recognition of this need has led to the modernized curriculum presented herein.

The curriculum in Industrial Engineering provides for thorough training in Engineering fundamentals and basic course work in the fields of Mechanical and Electrical Engineering. The studies prescribed within the department provide for intensive training in the various branches of Industrial Engineering. The specialization courses starting in the Junior year are planned for progressive instruction in the principles and techniques of industrial engineering as practiced in industry. The department emphasizes the humanistic aspects of production through the provision of studies in humanities and in classroom work within the department.

The Department cooperates with other departments on Campus, particularly with the Psychology Department and the Institute of Statistics. The work in these two fields is closely related to that of industrial engineering with the result that students at this College have an exceptional opportunity for broader training in preparation for their industrial activity. Other departments in the School of Engineering offer courses which industrial engineering students may elect for additional technical training, and it is expected that students in other departments may wish to elect industrial engineering courses.

A fifth-year program leading to an advanced degree has been developed for students of exceptional ability. Graduates of this institution or other institutions offering substantially equivalent undergraduate training in industrial engineering are admitted to this program. This program is highly specialized and the prescribed courses are designed to train a student to progress to top-management positions as he develops experience with an industrial concern. Elective courses are provided to allow the student to progress in a selected field along with the specialization developed in the departmental studies.

CURRICULUM IN INDUSTRIAL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Shopwork, M.E. 116	1	0	0
Machine Shop II, M.E. 227, 228	0	1	1
Industrial Organization and Management, I.E. 206, 207	3	3	0
*Humanities	3	3	3
**Military Science II, Mil. 201, 202, 203	2	2	2
Sport Activities, P.E. 201, 202, 203	1	1	1
	19	19	16

Junior Year

COURSES	CREDITS First Term	Second Term	Third Term
Engineering Mechanics, E.M. 311, 312, 313	3	3	3
Engineering Thermodynamics, M.E. 307, 308, 309	3	3	3
Mechanical Engineering Laboratory I, M.E. 313, 314, 315	1	1	1
Machine Shop II, M.E. 229	1	0	0
Industrial Psychology, Psych. 337	0	0	3
Introduction to Industrial Statistics, Stat. 361	3	0	0
Accounting for Engineers, Econ. 212	3	0	0
Manufacturing Processes, I.E. 328	0	3	0
Time and Motion Analysis, I.E. 332	0	3	0
Time and Motion Laboratory, I.E. 336	0	1	0
Plant Layout and Design, I.E. 343	0	0	3
Plant Layout Laboratory, I.E. 349	0	0	1
*Humanities	0	3	3
*Electives	3	3	3
	17	20	20

† Summer Requirement: Six weeks' industrial employment.

Senior Year

Elements of Electrical Engineering, E.E. 320, 321, 322	3	3	3
Electrical Engineering Laboratory, II, E.E. 325, 326, 327	1	1	1
Production Control, I.E. 407, 409	3	0	3
Manufacturing Costs, I.E. 421, 422, 423	3	3	3
Industrial Personnel Problems, I. E. 431, 432, 433	3	3	3
Seminar, I.E. 451, 452, 453	1	1	1
*Humanities	3	3	3
*Electives	3	3	3
	20	17	20

* Courses must be approved by the Department.
** Or six credits in one or two of the following departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology, Ethics and Religion.
† Waived for students graduating prior to 1950. See page 102.

INDUSTRIAL ENGINEERING—FURNITURE OPTION

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	Terms and Credits F	W	S
Calculus I, II, III, Math, Math. 201, 202, 303	4	4	4
*Business English, Public Speaking, Eng. 211, 231, and Elective English	3	3	3
Physics for Engineers, Phys. 201, 202, 203	4	4	4
General Economics, Econ. 201, 202, 203	3	3	3
Shopwork, M. E. 124, 125, 126	2	2	2
Wood Technology, Forestry 201	3	0	0
Industrial Management, Econ. 325, 326	0	3	3
†Military Science, II, Mil. 201, 202, 203	2	2	2
Sports Activities, P. E. 201, 202, 203	1	1	1
	22	22	22

Junior Year

Engineering Mechanics, E. M. 311, 312	3	3	0
Strength of Materials, E. M. 321	0	0	3
Engineering Thermodynamics, M. E. 307, 308, 309	3	3	3
Mech. Eng. Lab. I, M. E. 313, 314, 315	1	1	1
Forest Products, Forestry 422	0	3	0
Lumber Seasoning and Grading, Forestry 321	3	0	0
Fabric Structure and Analysis, Textiles 235, 236	2	2	0
Fabric Testing, Textiles 343	0	0	1
Accounting, Econ. 212	3	0	0
Motion and Time Study, I. E. 322	0	3	0
Management Engineering, I. E. 201, 202, 203	3	3	3
Factory Layout and Equipment, M. E. 224	0	0	3
Electives	3	3	3
	21	21	17

**Summer requirement: Six weeks industrial employment.

Senior Year

COURSES	F	W	S
Technical Writing, I, Eng. 321	3	0	0
Business Law, Econ. 307	3	0	0
Industrial Psychology, Psychol. 338	0	0	3
Timber Preservation, Forestry 301	3	0	0
Plywood and Glue, Forestry 322	0	3	0
Labor Problems, Econ. 331	3	0	0
Industrial Relations, Econ. 332	0	3	0
Personnel Management, Econ. 333	0	0	3
Elements of Electrical Engineering, E. E. 320, 321, 322	3	3	3
Electrical Engineering Laboratory II, E. E. 325, 326, 327	1	1	1
Electrical Industry, I. E. 402	0	3	0
Industrial Engineering Problems, I. E. 312, 313	0	3	3
Engineering Economics, I. E. 301	0	0	3
Electives	3	3	3
	19	19	19

Terms and Credits

* Students who have been certified by the Department of English as proficient in English may substitute Modern Language for the courses listed.

† Or six credits in one or two of the following departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology, Ethics and Religion.

** Waived for students graduating prior to 1950. See page 102.

Graduate Study in Industrial Engineering

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Industrial Engineering leading to the degree of M.S. in I.E., or to the M.I.E. To qualify for the latter degree, the following curriculum may be followed:

Fifth-Year Curriculum in Industrial Engineering

COURSES	CREDITS First Term	Second Term	Third Term
Management Engineering, I.E. 501, 502	3	3	0
Budgeting, I.E. 511, 512	3	3	0
Production Engineering, I.E. 522, 523	0	3	3
Management of Employee Relations, I.E. 533	0	0	3
Government Regulation of Industrial Enterprise, I.E. 541, 543	3	0	3
Seminar, I.E. 571, 572, 573	1	1	1
Project Work, I.E. 581, 582, 583	1	1	1
*Electives	6	6	6
	17	17	17

* Electives are restricted to one or two fields of study in courses approved in advance by the Department. These electives will normally be in Psychology, Statistics, Industrial Engineering, or other Engineering Departments.

MECHANICAL ENGINEERING

Professor K. P. Hanson, Head of the Department

Professors H. B. Briggs, N. W. Conner, J. S. Doolittle, E. G. Hoefer, L. L. Vaughan, F. B. Wheeler; Associate Professors W. S. Bridges, T. C. Brown, A. G. Guy, P. E. Moose, W. E. Selkinghaus; Assistant Professors W. E. Adams, R. L. Cope, P. B. Leonard, T. J. Martin, Jr., R. W. Truitt; Instructors J. G. Bourne, J. D. Brockington, J. C. Cheatham, R. H. Duncan, M. L. English, T. E. Hyde, T. B. Ledbetter, E. H. Lewis, P. H. McDonald, C. W. Maddison, T. L. Nash, W. M. Neale, Jr., G. T. Nickell, E. H. Stinson, R. T. Troxler, J. K. Whitfield.

The Mechanical Engineering Department offers a four-year bachelor's program in Mechanical Engineering and in Aeronautical Engineering as an option in the Mechanical field. The curricula in both the Mechanical Engineering and the Aeronautical option are accredited by the Engineers' Council for Professional Development.

The Mechanical Engineer is primarily a designer and builder of machines and other equipment for use in manufacturing processes, transportation, and the generation of power. He is responsible for the conservation and economical use of the power-producing resources of the world through the application of the proper equipment in each field of production. He is called upon to take charge of the management of the manufacturing and power industries. For the Mechanical Engineer to be well grounded in his profession, he must be thoroughly familiar with both the science and the art of engineering.

The curriculum in Mechanical Engineering begins with a thorough training in Mathematics, Physics, and Chemistry, as a foundation for the technical work which is later developed along several parallel lines. The student is taught how these fundamental sciences are applied to the physical properties of the materials of construction, and to the transformation of heat energy into work and power. This is accomplished by means of courses in theory and through the instruction in the various mechanical laboratories.

The curriculum in Aeronautical Engineering (option under Mechanical Engineering) embodies the same basic studies as the Mechanical Engineering program, specializing in Aeronautical sciences in the senior year. Graduates of this curriculum are prepared to take their places in the fields of design, production, and research in the Aeronautical industries.

The primary objective of the Aeronautical Option is to provide a sound general training in subjects fundamental to Aeronautical Engineering. In general, the professional subjects are directed toward aerodynamics and airplane design with special emphasis on the fundamental treatment of aeronautical science; to familiarize the student with the general principles of flight and with the details of design and construction as applied to the airplane. Classroom work is supported by experimental activities in the aeronautical laboratory which offers facilities in wind tunnel, structural, and hydrodynamic studies. The first three years of study are, for the most part, devoted to fundamental subjects; the strictly professional work being deferred until the fourth year.

For those students who have interest and ability a graduate program of varying possibilities is offered by the Mechanical Engineering Department. The specialized study may be in either Heat-Power, Design, or Aeronautics. The additional year program of advanced mechanical engineering study will qualify the student for a Master's degree.

Through the training offered in this department, it is hoped that the young graduate, after gaining some experience in industry, will be qualified to accept the responsibilities which will be imposed upon him in the Mechanical and Aeronautical industries.

CURRICULUM IN MECHANICAL ENGINEERING

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Humanities	3	0	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Descriptive Geometry, M.E. 201	2	0	0
Machine Drawing, M.E. 202	0	2	0
Shopwork, M.E. 114, 115, 116	1	1	1
Engineering Mechanics, E.M. 311, 312	0	3	3
Military Science, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1
	18	18	19

Junior Year

Humanities	3	3	3
Elementary Surveying, C.E. 201	3	0	0
Engineering Mechanics, E.M. 313	3	0	0
Engineering Thermodynamics, M.E. 307, 308, 309	3	3	3
Mech. Eng. Lab. I, M.E. 313, 314, 315	1	1	1
Kinematics, M.E. 317, 318, 319	3	3	3
Metallurgy, M.E. 322, 323	0	3	3
Strength of Materials, E.M. 321, 422	0	3	3
Machine Shop, M.E. 227, 228, 229	1	1	1
Electives (Or Military)	3	3	3
	20	20	20

Summer requirement: Six weeks' industrial employment.

Senior Year

Humanities	3	3	3
Fluid Mechanics, E.M. 430	3	0	0
Power Plants, M.E. 401, 402, 403	3	3	3
Mech. Eng. Lab. II, M.E. 407, 408, 409	1	1	1
Machine Design, M.E. 411, 412, 413	3	3	3
Elements of Electrical Engineering, E.E. 320, 321, 322	3	3	3
Electrical Eng. Laboratory, E.E. 325, 326, 327	1	1	1
Electives (Or Military)	3	3	3
	20	17	17

CURRICULUM IN THE AERONAUTICAL OPTION

Mechanical Engineering Department

For the Freshman Year, refer to page 104.

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
Humanities	3	3	3
Calculus I, II, III, Math. 201, 202, 303	4	4	4
Physics for Engineers, Phys. 201, 202, 203	5	5	5
Descriptive Geometry, M. E. 201	2	0	0
Machine Drawing, M. E. 202	0	2	0
Shopwork, M. E. 116	1	0	0
Engineering Mechanics, E. M. 311	0	0	3
Military Science, Mil. 201, 202, 203	2	2	2
Physical Education, P. E. 201, 202, 203	1	1	1
	18	17	18

Junior Year

Humanities	3	3	3
Differential Equations, Math 401a	3	0	0
Engineering Mechanics, E. M. 312, 313	3	3	0
Engineering Thermodynamics, M. E. 307, 308, 309	3	3	3
Mech. Eng. Lab I, M.E. 313, 314, 315	1	1	1
Metallurgy, M.E. 322, 323	0	3	3
Elements of Aero. Eng., Ae.E. 310	0	0	3
Kinematics, M.E. 317	3	0	0
Strength of Materials, E.M. 321, 422	0	3	3
Machine Shop, M.E. 227, 228, 229	1	1	1
Electives (Or Military)	3	3	3
	20	20	20

Summer requirement: Six weeks' industrial employment.

Senior Year

Humanities	3	3	0
Internal Combustion Engines, Dies. 401, 402, 403	3	3	3
Airplane Design, Ae.E. 421,423, 423	3	3	3
Aerodynamics, Ae.E. 431, 432, 433	3	3	3
Aeronautical Laboratory, AeE. 441, 442, 443	1	1	1
Fluid Mechanics, E.M. 430	3	0	0
Elements of Electrical Engineering, E.E. 320, 321	0	3	3
Electrical Engineering Lab, E.E. 325, 326	0	1	1
Electives (Or Military)	3	3	3
	19	20	17

GRADUATE STUDY IN MECHANICAL ENGINEERING

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Mechanical Engineering leading to the degree of M.S. in M.E., or the M.M.E. To qualify for the latter degree any of the following curricula may be followed.

FIFTH YEAR CURRICULA IN MECHANICAL ENGINEERING

Design

COURSES	CREDITS First Term	Second Term	Third Term
Vibration Problems, E.M. 454	0	3	0
Hydraulic Machinery, E.M. 431	0	0	3
Adv. Mach. Design, M.E. 505, 506, 507	3	3	3
Mech. of Machinery, M.E. 541, 542	0	3	3
Metallurgical Factors in Design, M.E. 418	3	0	0
Advanced Strength of Materials, E.M. 451	0	0	3
Differential Equations, Math. 401a	3	0	0
Mech. Engineering Seminar, M.E. 525, 526, 527	1	1	1
Machinery Lab., M.E. 531, 532, 533	1	1	1
Mangt. Engineering, I.E. 501, 502	3	3	0
Elective	3	3	3
	17	17	17

Heat-Power

Differential Equations, Math. 401a	3	0	0
Advanced Engineering Thermodynamics, M.E. 501	3	0	0
Refrigeration, M.E. 405	0	3	0
Heat Transfer, M.E. 464	0	3	0
Vibration Problems, E.M. 454	0	0	3
Management of Employee Relations, I.E. 533	0	0	3
Heating and Air Conditioning, M.E. 451, 452, 453	3	3	3
Advanced Power Plants, M.E. 513, 514, 515	3	3	3
Mechanical Engineering Seminar, M.E. 525, 526, 527	1	1	1
Project Work in Mech. Engr., M.E. 551. 552, 553	1	1	1
Elective	3	3	3
	17	17	17

Aeronautical Option

Metallurgical Factors in Design, M.E. 418	3	0	0
Advanced Mathematics, Math. 511, 422, 413	3	3	3
Advanced Aerodynamics, Ae.E. 531, 532, 533	3	3	3
Aeronautical Engr. Seminar, Ae.E. 541, 542, 543	1	1	1
Theory and Design of Aircraft Structures, Ae.E. 571, 572, 573	3	3	3
Hydrodynamics, Ae.E. 551, 552	0	3	3
Advanced Performance Problems, Ae.E. 561, 562, 563	3	3	3
Project Work in Aero. Engr., Ae.E. 520, 521, 522	1	1	1
	17	17	17

ENGINEERING GENERAL

The Engineering-General Curriculum.—This curriculum was instituted in September, 1947, in an attempt to provide creditable engineering instruction of a fundamental nature for students who could not be accommodated, because of the limited capacity of laboratories, in the regular curricula in the major fields of engineering. The Engineering-General curriculum does not provide specialized instruction beyond the fundamental level in any of the fields of engineering; but it includes the same mathematical and physical preparation as the other curricula, and a number of carefully planned survey courses in the various specialized fields. In addition, courses in accounting, business and statistics are included to a number sufficient to provide a good foundation in these fields for the student.

While the Engineering-General curriculum does not fulfill the functions of the curricula in specialized fields, it serves to prepare men for careers in sales engineering, application, and in production activities of technological enterprises. In view of this fact, students whose tastes develop in such directions are encouraged to consider transferring to this curriculum at the beginning of their junior year. This program leads to the degree of Bachelor of Science in Engineering-General.

There is no special department to handle the Engineering-General curriculum. Students registered in this curriulum retain their affiliation with the Engineering Department in which they originally started their engineering career. They are advised in this department and may join its technical societies. The Engineering-General curriculum is a flexible program, and any engineering student who has completed two years of work may, with the approval of his department head and the Director of Instruction of the School of Engineering, enroll for the curriculum.

The Engineering-General curriculum has been authorized for a period of three years only. No students will be admitted to it who cannot complete their work by June, 1950.

ENGINEERING-GENERAL CURRICULUM

Freshman and Sophomore Years.—As listed for the various degree-granting departments in the Catalog Issue 1945-46 of the State College Record.

Junior Year

COURSES	CREDITS First Term	Second Term	Third Term
Economics or Engrg. Mech, Eco. 201, 202, or E.M. 311, 312	3	3	0
Economics, Eco. 203	0	0	3
Eng. Thermo., M.E. 307, 308	3	3	0
Approx. Methods in Mathematics, Math. 311	0	0	3
General Eng. Geol., Geol. 315, 316	3	3	0
Elements of Chem. E. I and II, Ch.E. 301, 302	0	3	3
Principles of Accounting, Eco. 301, 302	3	3	0
Business Law, Eco. 307	0	0	3
Experimental Statistics, Stat. 361, 362, 363	3	3	3
*Electives	6	3	6
	21	21	21

Senior Year

COURSES	First Term	Second Term	Third Term
Engr. Mech; Strength of Mat., E.M. 313, 321	3	3	0
Principles of Electrical Engr. E.E. 320, 321	3	3	0
Industrial Minerals & Rocks, Cer.E. 430	0	3	0
Ceramic Mining and Processes, Cer.E. 431	0	0	3
Prin. of Ind. Engineering, I.E. 371, 373, 374	2	2	2
Constr. Mats. and Estimates, C.E. 351, 352, 353	2	2	2
Modern Physics, Phys. 407	0	0	3
Tech. Writing, Eng. 321	0	0	3
Internal Comb. Engines, Dies. 408	3	0	0
*Electives	6	6	6
	19	19	19

*To be selected from the following fields: Humanities, Military Science, III & IV, Language and Literature, Pure Mathematics, Pure Natural Science and Social Science.

FUNCTIONAL DEPARTMENTS

The following departments are an important part of the School of Engineering. While they do not offer undergraduate programs leading to the Bachelor's degree, they are charged with specific responsibilities. In some instances they conduct service courses for students in the various fields of engineering; in other instances they offer programs of advanced study for graduate students; and another activity is fundamental and applied research.

DIESEL ENGINEERING

Professor Robert B. Rice, Head of the Department
Instructors D. J. Hanse, W. H. Kite, Jr., J. M. Monroe, D. F. O'Donnell
Special Lecturers A. Hoermann, A. W. Hussmann

The Graduate Department of Diesel Engineering, established by State College of the University of North Carolina, was created to carry on research activities and graduate studies in the Diesel Field and associated branches of industry.

The educational plan of the Department is designed around the industry's need for scientists, designers, and research workers, not only in the manufacture of Diesels but in the numerous fields of transportation and power generation where they are universally employed. The prime function of the Department is to offer education at the graduate level for both graduate degrees and for the retraining of engineers now in industry. The educational program will be integrated closely with research projects involving both pure science and applied science.

The Department now offers programs of study leading to the degree of Master of Science in Diesel Engineering built around exacting requirements in the field of Diesel design, Diesel power plant design, experimental Diesel engineering, and Diesel operation and maintenance.

The research requirements for graduate degrees will be met in the Department's new and modern laboratories, which are equipped to investigate all phases of the Diesel, away from the confining and demanding requirements of manufacturing and production in an environment dominated by specially trained minds where the study and development of Diesels is sine qua non. Here investigations will be conducted by imaginative and creative thinking young men.

The program of study is designed to be liberal to a point where a candidate may in addition to his Diesel activities select graduate courses in the fields of chemistry, economics, electrical engineering, engineering mechanics, mathematics, modern languages, mechanical engineering, physics, or statistics. Any student with a satisfactory scholastic record and a Bachelor's Degree, or the equivalent, from a qualified university approved by the Association of American Universities will be admitted. A Diesel graduate student will be subject to all regulations and conditions of the Graduate School of the University of North Carolina.

It is the plan of the Department to cooperate closely with the Diesel manufacturers as well as those fields wherein the Diesel is the most economical and universal prime-mover, especially the field of Transportation. Toward this end the Department maintains close contact with the Diesel Industry and the Professional Societies dedicated to promote the Science of Oil and Gas Power in the Diesel Field.

The Department encourages Summer employment in the Diesel industry for its graduate students in an effort to vitalize the student's program of study and to better integrate it with the actual scientific problems of the various fields of the industry.

A Student enrolled as an upperclassman in any college or university approved by the Association of American Universities and planning to continue his studies at the graduate level in the Diesel Field will find it advantageous to consult with this Department concerning the selection of his curriculum and senior electives.

For general regulations, the announcement of the Graduate School in this catalog should be consulted.

FIFTH YEAR PROGRAMS IN DIESEL ENGINEERING

I—Power Plant Design

COURSES	CREDITS First Term	Second Term	Third Term
Internal Combustion Engines, II, Dies. 501, 2, 3	4	4	4
Diesel Power Plant Design, Dies. 513, 14, 15	5	5	5
Diesel Installation, Operation & Maintenance, Dies. 421, 22	3	3	0
Diesel Manufacture, Dies. 541	0	0	3
Seminar, Dies. 551, 52, 53	1	1	1
Advanced Dynamo Laboratory, E.E. 411, 12, 13	1	1	1
Electrical Power Applications, E.E. 451, 52, 53	3	3	3
	17	17	17

II—Internal Combustion Engine Design

Internal Combustion Engine Lubrication, Dies. 414	0	0	3
Internal Combustion Engines, II, Dies. 501, 2, 3	4	4	4
Diesel Engine Design, II, Dies. 505, 6, 7) or Gas Engine Design, II, Dies. 509, 10, 11)	5	5	5
Supercharger Design, Dies. 529	3	0	0
Fuel Injector Design, Dies. 530	0	3	0
Seminar, Dies. 551, 52, 53	1	1	1
Physical Metallurgy, M.E. 441, 42	3	3	0
Advanced Strength of Materials, E.M.. 451	3	0	0
Engine Balancing, Dies. 521	0	5	0
Introduction to Elasticity, E.M. 503	0	0	3
	19	21	19

THE DEPARTMENT OF ENGINEERING RESEARCH

W. G. Van Note, Director and Head

Research Associates: G. M. Armstrong, W. C. Bell; Research Assistants: R. B. Adair, J. E. Deas, R. M. Foster, N. R. Sewell, R. K. Shumaker; Engineering Aide: W. W. Harper; Analyst: Nina G. Sumner.

Research as an essential part of higher education is recognized by the School of Engineering, and support of investigations of both fundamental and applied natures is given by the School through the Department of Engineering Research. Originally established in 1923 as the Engineering Experiment Station, the Department now maintains laboratories and a full-time staff devoted exclusively to research activity. It operates as one of the units within the Engineering School, yet maintains a close association with the other engineering units. This cooperation takes the form of the interchange of advice, of the placing of certain research problems or portions from them in departmental laboratories when it is desirable, of the assignment of staff to departmental faculty as assistants, and of requesting faculty to accept the technical direction of a portion of the projects conducted in Engineering Research laboratories.

Further, the teaching personnel of the Engineering School is encouraged and supported by the Department in research activities of its own choosing. To assure wider benefits for both graduate and undergraduate students from the engineering research activities, the Department offers several Research Fellowships and employs, on a part-time basis, various numbers of the more promising and deserving students as assistants in the laboratory.

In addition to its function as a basic contributor to the development of the educational program of the Engineering School, the Department provides for both North Carolina and its neighbors a large engineering research center. Its program is designed to be of vital service to industry and also one in which research personnel for the South will be trained. The program is patterned to offer active cooperation with industry, state and Federal government agencies, and individuals. Its function is three-fold:

(1) To support fundamental researches in the fields of the applied sciences.

(2) To develop new or improved processes that will provide wider utilization of the natural resources of the State.

(3) To offer to industry, both large and small, complete research services devoted to the solution of technical problems and the development of new products.

The Department is well organized to carry out these objectives. Two large laboratories and administrative offices are housed in a modern fireproof building, and basic equipment is at hand. Administrative and technical personnel are well trained in the theories and practice of engineering, and their combined records show wide experience in previous industrial research. The Engineering Research staff is augmented by personnel engaged with the support of sponsors for whom work is done under contract. The Department directorship is advised by a carefully chosen committee representing the School of Engineering.

Association is sought with Federal and other North Carolina agencies to the end of expanding the development of the wide natural resources of the state. Particular encouragement and assistance are granted those investigations that give promise of new industry to North Carolina. Research currently in progress includes work being done for the Bureau of Ships of the U. S. Navy and the Federal Department of Commerce. Work is included in the fields of structural clay, Portland cement, glazes, tile beam design, plastics, heat transfer problems, fluid flow, vibration studies, valve design, fuel oils, stream pollution, precipitation hardening and diffusion in alloys, electrostatic field measurements, and industrial and technical surveys.

The results of the engineering investigations, upon their conclusion, are published as bulletins so that the information obtained may be made available to the public and be contributed to the total field of technical knowledge. The following bulletins have been published in the past year:

Bulletin No. 32. "Flammability Characteristics of Plastic Materials. I. Surface Temperatures of Rigid Plastics at Ignition," by E. M. Schoenborn and D. S. Weaver, Jr.

Bulletin No. 33. "A Practical Method for Predicting the Effects of Common Acids and Alkalies on the Survival of Fish," by R. E. Stiemke and W. W. Eckenfelder.

Bulletin No. 34. "The Extent of Stream Pollution in North Carolina," by R. E. Stiemke.

Bulletin No. 35. "Evaluation of North Carolina Raw Materials for Manufacture of Cement. I. Preliminary Laboratory Investigations," by R. B. Adair, T. C. Doody, and E. M. Schoenborn.

Bulletin No. 36. "Tests on a Novel Fan Blade," by N. W. Conner and E. P. Cain.

Bulletin No. 37. "Beach Erosion in North Carolina," by C. E. Feltner.

A complete list of the bulletins published to date or any other information pertaining to the operation or availability of the facilities of the Department will gladly be furnished upon request.

ENGINEERING MECHANICS

Professor G. Wallace Smith, Head of the Department
Associate Professor Adolphus Mitchell
Associate Professor C. E. Feltner
Instructors L. W. Long, V. A. Harvill, J. A. Williams, J. H. Johnson, J. S. Brown
Visiting Professor H. F. Girvin

Undergraduate Study

The Department of Engineering Mechanics teaches and administers the courses in theoretical and applied mechanics, strength of materials, and fluid mechanics. These courses are fundamental to the professional and design courses of the several engineering curricula. The student is expected to acquire a basic knowledge of the physical properties of materials, and the laws that govern their use in engineering design.

Graduate Study

This department offers supporting courses for advanced work in the field of machine design, structural design, and the flow of fluids as required of students seeking the Master's Degree.

Likewise a student interested in investigation and research, and who has the proper prerequisites, may take a course of study offered by this department which leads to the degree of Master of Engineering Mechanics, or Master of Science in Engineering Mechanics. In the former case, the following curriculum must be followed.

Graduate Curriculum Leading to the Degree of Master of Engineering Mechanics

COURSES	CREDITS First Term	Second Term	Third Term
Advanced Strength of Materials, E.M. 401	3	0	0
Hydraulic Machinery, E.M. 431	3	0	0
Vibration Problems, E.M. 404	0	0	3
Advanced Mechanics, E.M. 406	0	3	0
Strain Energy Method of Stress Analysis, E.M. 501	0	3	0
Elastic Stability, E.M. 502	0	0	3
Introduction to Elasticity, E.M. 503	0	0	3
Advanced Fluid Mechanics, E.M. 508	4	0	0
Similitude for Engineers, E.M. 511, 12	0	4	4
Differential Equations, Math 431 a or b	3	0	0
Advanced Differential Equations, Math 432	0	3	0
Graphical and Numerical Methods, Math 402	3	0	0
Advanced Calculus for Engineers, Math 412	0	3	0
Series for Engineers, Math 413	0	0	3
Seminar, E.M. 510	1	1	1
	17	17	17

THE DEPARTMENT OF MATHEMATICS

Professor H. A. Fisher, Head of the Department

Professors R. C. Bullock, J. W. Cell, J. M. Clarkson, Jack Levine, C. G. Mumford, H. Page Williams, L. S. Winton; Associate Professors H. M. Nahikian, H. V. Park, C. F. Strobel; Assistant Professors E. J. Canaday, C. L. Carroll, Jr., D. M. Peterson, G. C. Watson, V. R. Brantley, C. H. Little, Jr., A. R. Nolstad, P. E. Lewis; Instructors S. R. Baker, J. N. Bond, M. H. Clayton, H. C. Cooke, Janie Crumpton, (Mrs.) Martha J. Garren, W. J. Graves, Anna Mae Harris, (Mrs.) Ruth B. Honeycutt, (Mrs.) Beatrice R. Hosley, Martha Ivey, J. A. Kelley, C. F. Lewis, Armstrong Maltbie, (Mrs.) Carlotta P. Patton, H. A. Petrea, Peter Shahdan, H. E. Speece, N. V. Swenson, Doris Tillery, J. G. Wall, Peggy Witherington.

Mathematics is one of the basic sciences in Engineering. At State College the large and competent Mathematics Department not only teaches the subject as a science but also gives a large amount of drill and practice to the students so that, upon completion of the courses, the students not only know the subject matter but are skilled and rapid in its use when applied to the problems of technology.

ENGINEERING MATHEMATICS

Graduate Study

The curriculum in Engineering Mathematics will be taken generally by a student who has completed work for the bachelor's degree in some phase of engineering. However, it may be taken also by one who has acquired the Bachelor of Arts degree provided he takes the listed prerequisite courses.

The curriculum is designed for several purposes—to remedy an alarming deficiency in trained teachers in Engineering Mathematics, to provide supplementary courses of a distinguished quality for other engineering curricula, to foster mutual scholarly attainments with members of other departments, and to provide men for industry with the necessary training to apply advanced mathematics to engineering problems.

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Engineering Mathematics leading to the degree of Master of Mathematics or Master of Science in Mathematics. To qualify for the latter degree, the following curriculum may be followed.

Prerequisites:

a. Drawing—4 credits
b. Mechanics—9 credits
c. Fluid Mechanics—3 credits
d. Strength of Materials—3 credits
e. Physics—15 credits
f. Differential Equations—3 credits

Required Courses:

COURSES	CREDITS First Term	Second Term	Third Term
Theory of Equations, Math 402	0	3	0
Advanced Calculus for Engineers, Math 411	3	0	0
Series for Engineers, Math 413	0	0	3
Vector Analysis, Math 423	0	0	3
Ordinary and Partial Differential Equations, Math. 501, 502	3	3	0
Complex Variable, Math. 511	3	0	0
Operational Mathematics, Math 512	0	3	0

A minimum of 21 additional credits shall be required and they shall be selected in consultation with an advisory committee. At least 15 of these 21 hours shall be chosen in either one or two fields of engineering, and representatives of the engineering departments concerned shall be members of the advisory committee.

THE PHYSICS DEPARTMENT

Professor J. S. Meares, Acting Head of the Department

Professors Emeriti C. M. Heck, J. B. Derieux; Professors F. W. Lancaster, William Wilson; Associate Professor R. F. Stainback; Assistant Professors E. J. Brown, J. T. Lynn; Instructors W. G. Banick, Edith L. Burgess, G. W. Crawford, A. K. Darby, W. C. Drane, Minnie C. Harris, R. M. Helms, P. B. Mitchell, H. C. Morrison, W. A. Page, W. A. Parker, J. R. Patterson, C. S. Stroup, Ruth M. Wiggins.

Physics is one of the basic sciences upon which Agriculture, Engineering and Textiles are founded. The Department offers several basic general Physics courses adapted to the needs of the curricula in the above fields. In addition to the general courses a number of courses of a more specialized nature are available to undergraduates and graduates as electives.

Curriculum.—The Department offers a fifth year curriculum in Engineering Physics to meet the rapidly growing demand for men better trained in the subject matter and methods of Physics. This curriculum supplements the basic four-year Engineering curricula with an additional year primarily devoted to basic Physics, both theoretical and applied, with an introduction to research procedure. It is designed to prepare students to fill the growing need in industrial and government laboratories for research and development work in the borderline field between Engineering and pure Physics.

CURRICULUM IN ENGINEERING PHYSICS

Fifth Year
Prerequisites

	CREDITS		CREDITS
a. Drawing	4	e. Thermodynamics	6
b. Mechanics	9	f. Physics	15
c. Strength of Materials	3	g. Differential Equations	3
d. Fluid Mechanics	3	h. Vector Analysis	3

Required Courses

COURSES	CREDITS First Term	Second Term	Third Term
Geometrical and Physical Optics, Phys. 415, 416	3	3	0
Adv. Physical Measurements, Phys. 431, 432, 433	2	2	2
Modern Physics, Phys. 407	0	3	0
Adv. Mechanics, Phys. 501	3	0	0
Adv. Electricity and Magnetism, Phys. 514 515	0	3	3
Adv. Heat, Phys. 513	0	0	3
Special Problems, Phys. 541, 542, 543	1	1	1

A minimum of 18 additional credits shall be required and they shall be selected in consultation with an advisory committee from the Department of Physics. At least 12 of these 18 hours shall be chosen in either one or two fields of engineering and mathematics, and representatives of the engineering departments concerned shall be members of the advisory committee.

SCHOOL OF EDUCATION

* J. Bryant Kirkland, Dean

† Leon E. Cook, Acting Director

‡ T. E. Browne, Director Emeritus

Purposes.—The Division of Teacher Education at North Carolina State College is organized and equipped for the purpose of carrying out a specific function allocated to the College by the trustees of the Greater University. The particular objective of this Division is to provide professional training, to organize curricula, and to give direction to those students who indicate an interest in becoming teachers of Vocational Agriculture, Trade and Industrial Education and Industrial Arts Education. The technical subject matter instruction for such teachers is provided by the technical schools on the Campus.

Provision has recently been made for students holding a Bachelor's Degree to enroll for courses or enter the Graduate School for a Master's Degree in Occupational Information and Guidance. Also a curriculum in Industrial and Rural Recreation has been introduced for the preparation of directors and leaders of programs of recreation in industrial plants and in rural communities.

The State Board for Vocational Education has designated State College as the training center for vocational teachers in the fields of Agriculture and Industrial Education, and federal funds are used to aid in the maintenance of teacher training in these two fields.

Organization.—The Division offers graduate and undergraduate curricula for the preparation of teachers of Agriculture, of Industrial Arts, and of Industrial Education. The training includes four definite objectives. The first embraces the fundamentals of general education: English, mathematics, sociology, history, and the natural sciences—biology, geology, chemistry, and physics. Next are the technical subjects selected according to the professional course of the student: for Agricultural Teaching, in the School of Agriculture; for Industrial Arts and Industrial Education, in the School of Engineering. In the third group are the principles and methods of teaching. Educational Psychology here is obviously essential. The last objective is practical experience. To meet the requirements of the State Department of Public Instruction for teaching certificates, students, before graduation, observe and teach under the direction of the faculty of the Division in selected high schools. Moreover, experience in the respective occupations is rquired for those preparing to teach agriculture, and the trades and industries.

Requirements for Graduation.—For graduation in the Division of Teacher Education, the scholastic requirement is the satisfactory attainment of at least 230 term credits with not fewer than an equal number of honor points in all curricula except Industrial and Rural Recreation in which 239 term credits and an equal number of honor points are required.

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* Appointment effective June, 1948.
† Acting Director 1947-48.
‡ Retired September 1, 1947.

Of the term credits required for graduation, a student must have at least 27 in Education, 18 in Language, 18 in the Natural Sciences, 18 in Social Science, 12 in Military Training or alternatives, 6 in Physical Education. Subjects must be taken as indicated in the several curricula.

Students who enter with advanced standing are allowed one point for each term credit accepted.

Further requirements consist of practice teaching in the subject and practical experience in the work to be taught as indicated above or under the several Departments.

Degrees.—Upon the satisfactory completion of one of the curricula in Education, a student is awarded the degree of Bachelor of Science with the name of his special curriculum appended: in Agricultural Education, in Industrial Arts Education, in Industrial Education, and in Industrial and Rural Recreation.

The Division of Teacher Education offers work for the Master's Degree to students of recognized ability in Agricultural Education, Industrial Arts Education, Industrial Education, and in Occupational Information and Guidance. For details see the section describing the work of each of the above departments, and the statement of the State College Division of the Graduate School in this catalog.

AGRICULTURAL EDUCATION

Professor Leon E. Cook, Head of Department

Professors L. O. Armstrong, J. K. Coggin, J. B. Kirkland

Associate Professor F. A. Nylund

Object.—Agricultural Education is designed to prepare students for positions as teachers of vocational agriculture in the high schools of the State, and to qualify as such under the provisions of the Smith-Hughes and the George-Barden Acts of Congress.

The curriculum is comprehensive in nature. It is, of course, essential that teachers have a good foundation in English and in the sciences basic to an understanding of agriculture. They should also have a sufficient understanding of the social sciences to appreciate the development of contemporary life, with the emphasis on those having to do with agriculture and the rural community. Manifestly they should have a grasp of agriculture in all phases of importance in the State, including the improvement of the farm home and of the social as well as of the economic development of the rural community. Proficiency in teaching vocational agriculture depends upon comprehensive and thorough preparation in the professional field with emphasis on personal relations and guidance, procedure in teaching both youth and adults, and in handling the various responsibilities of community service.

An adequate background of farm experience is essential for students looking forward to agricultural teaching, and experience in fields related to farming is desirable. A student should be farm-reared or should have several years of farm experience as a part of his preparation for teaching vocational agriculture.

Placement of Graduates.—There has been a strong demand for teachers of vocational agriculture with little difficulty in placing students who are qualified from the standpoint of personality, character, training, and farm experience. A coöperative arrangement with the supervisory staff in agricultural education of the State Department of Public Instruction facilitates the placement of students in situations adapted to their experience and training.

Successful teachers of agriculture are in demand for higher positions in the educational service and by other agencies for positions frequently offering higher salaries than those paid in the teaching profession.

Graduate Study.—The Department provides opportunities for students, fully qualified, to do graduate work in Agricultural Education. Graduate students taking majors in this field should have completed the undergraduate work in Agricultural Education or the equivalent. Transfer students, or graduates in general agriculture who did not take the work in education, are required to complete 15 credits in education including Principles of Teaching and Methods of Teaching Agriculture, as prerequisites to graduate study.

CURRICULUM FOR TEACHERS OF VOCATIONAL AGRICULTURE

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Algebra and Trigonometry, Math. 111, 112	4	4	0
U. S. History and Am. Government, Hist. 121, 122 and Pol. Sc. 211	3	3	3
Physical Geology, Geol. 120	0	0	4
General Botany, Bot. 101, 102 or Gen. and Economic Zoology, 101, 102	0	4	4
General Field Crops, F. C. 101 or Intro. to Animal Indus., A.I. 101	4	0	0
Introduction to Animal Industry, 101 or Gen. Field Crops, F. C. 101	0	4	0
General Horticulture, Hort. 101 or Gen. Poultry, Poul. 101	0	0	4
Introduction to Agriculture, Agr. 101	1	0	0
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
	18	21	21

Sophomore Year

English, elective	0	0	3
General Inorganic and Organic Chemistry, Chem. 201, 202, 203	5	5	5
General and Economic Zoology, Zool. 101, 102 or General Botany, Bot. 101, 102	4	4	0
General Poultry, Poul. 101 or General Horticulture, Hort. 101	4	0	0
General Physics, Phys. 115	0	0	5
Rural Sociology, Rur. Soc. 201 or Agricultural Economics, Agr. Econ. 202	3 or 4	3 or 4	0
Farm Equipment, Agr. Eng. 202 or Soils, Soils 202	0	4 or 5	4 or 5
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1
	19 or 20	19 or 20	20 or 21

Junior Year

English, elective	0	0	3
Educational Psychology, Psy. 303, 304	3	3	0
Visual Aids, Ed. 308	0	0	3
Principles of Forestry, For. 111	0	0	3
Farm-Shop Work, Eng. 331, 332	3	3	0
General Economics, Econ. 201, 202	3	3	0
Farm Accounting, Agr. Econ. 313	0	0	3
Plant Diseases, Bot. 315	0	0	4
Soil Fertility and Fertilizers, Soils 301	5	0	0
†Diseases of Farm Animals, A. I. 362	0	4	0
**Economic Entomology, Zool. 213	0	4	0
***Electives	4	3	3
	18	20	19

Senior Year

English, elective	0	0	3
Farm Management, Agr. Econ. 303	0	0	3
Plant Physiology, Bot. 321 or Animal Physiology, Zool. 201	5	0	0
Principles of Teaching, Ed. 406	3	0	0
Methods of Teaching Agriculture, Ed. 407	5	0	0
Observation and Directed Teaching, Ed. 408	0	5	0
Evening Classes and Directed Teaching, Ed. 411	0	5	0
Materials and Methods of Teaching Agriculture, Ed. 412	0	5	0
Agricultural Marketing, Agr. Econ. 411	3	0	0
Secondary Education in Agriculture, Ed. 426	0	0	3
***Electives	3	3	7
	19	18	16

†Livestock Production, A. I. 331 may be substituted for Diseases of Farm Animals, A.I. 362.

* Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology, and Sociology.

** General Bacteriology, Bot. 312 or Genetics, Zool. 411 may be substituted for Ec. Entomology, Zool. 213.

*** Options and electives except Mil. Sci. III and IV must be chosen with the approval of the adviser.

INDUSTRIAL ARTS EDUCATION

*Professor Ivan Hostetler, Head of Department
† Professor John R. Ludington
Supervisor of Student Teachers, C. Merrill Hamilton

Industrial Arts comprises that area of study and experience which deals with industry as a unit of society and the manner in which industry and its related materials, processes, and problems affects and has affected other units of society. For many years North Carolina State College has had an important part in aiding individuals and groups of individuals to cope with the increasingly complex problems of living in an industrial society through its program of teacher education.

The demand for competent teachers of Industrial Arts has increased year after year and the need for Industrial Arts as an essential phase of general education at the elementary and secondary school levels is being realized by progressive school communities and leaders in education.

Purposes.—The Department of Industrial Arts is organized to aid in the education of teachers and supervisors of Industrial Arts, and to provide experiences for those individuals who desire to deal more appreciatively and effectively with problems of living in a democratic-industrial society. The successful completion of this curriculum leads to the granting of the degree of Bachelor of Science in Industrial Arts Education and the fulfillment of requirements for an A-grade certificate for teaching in this field.

The first two years of work in this curriculum are in line with the Basic Division of the College, which emphasizes work of a general and foundational nature. The junior and senior years are planned to include experiences of a specialized-professional nature.

In addition to added faculty personnel, new facilities have been provided in the Department which include: laboratories, machines, tools, benches, classrooms, and library resources. Further increases in physical setting and equipment have been planned which will make North Carolina State College one of the leading Industrial Arts teacher-education centers in the Southeast.

Graduate Program.—Opportunities are provided for students of demonstrated interest and ability to do graduate work leading to the Master's Degree. The faculty personnel and resources of the Greater University of North Carolina are used in planning a sequence of experiences on the graduate level to meet the individual interests and needs of persons interested in Industrial Arts Education. Persons interested in graduate work in this field are invited to write for detailed information and courses offered.

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* Apointment effective college year 1948-49.
† Resigned June 1948.

CURRICULUM FOR TEACHERS OF INDUSTRIAL ARTS

Freshman Year

COURSES	CREDITS First Term	Second Term	Third Term
Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trigonometry, and Mathematics of Finance Math. 111, 112, 113	4	4	4
General Chemistry, Chem. 101, 102, 103	4	4	4
Industrial Arts Drawing, Ed. (I. A.) 105a, b, c	3	3	3
Industrial Arts, Ed. (I. A.) 106 a, b, c	3	3	3
†Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
	20	20	20

Sophomore Year

COURSES	First Term	Second Term	Third Term
Business English, Eng. 211, Public Speaking, Eng. 231, Elective English	3	3	3
Textile Physics, Phys. 111, 112, 113	4	4	4
Economic History, Hist. 101, 102, 103	3	3	3
Industrial Arts Design, Ed. (I. A.) 205	0	0	3
General Sociology, Soc. 202, 203	3	3	0
Laboratory Problems in Industrial Arts, Ed. 206 (I. A.) a, b, c	3	3	3
†Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1
	19	19	19

Junior Year

COURSES	First Term	Second Term	Third Term
Introduction to Psychology, Psychol. 200, Educational Psychology, Ed. 304, Psychology of Adolescence, Ed. 476	3	3	3
General Economics, Econ. 201, 202, 203	3	3	3
Problems in Secondary Education, Ed. 344, Field Work in Secondary Education, Ed. 433, Visual Aids, Ed. 308	3	3	3
Laboratory Problems in Industrial Arts, Ed. 306 (I. A.) a, b, c	3	3	3
Business Law, Econ. 307	3	0	0
**Electives	3	3	3
*Electives in Related Technical and Shop Courses	3	5	3
	21	20	18

Senior Year

COURSES	First Term	Second Term	Third Term
Methods of Teaching Industrial, Ed. 422, Observation and Directed Teaching, Ed. 444	3	3	3
Labor Problems, Econ. 331, Principles of Guidance, Ed. 420	3	3	0
Occupational Studies, Ed. 424	0	0	3
Curriculum Problems in Industrial Arts, Ed. 482, Instructional Aids and Devices, Ed. 483, Laboratory Planning and Equipment Selection, Ed. 484	3	3	3
**Electives	3	3	3
*Electives in Related Technical and Shop Courses	6	6	6
	18	18	18

* Electives to be selected with aid of adviser to meet special needs of individual students.

† Or six credits in one or two of the following departments: Economics, Psychology, History and Political Science, Modern Languages, Sociology, and Ethics and Religion.

** To be selected from the following fields: Humanities, Military Science III and IV, Language and Literature, Pure Mathematics, Pure Natural Science and Social Science.

INDUSTRIAL EDUCATION

Associate Professor Louis B. Beres, Head of Department

Object.—Vocational technical skills are necessary to the industrial development of any state. Many influential groups are urging the development of new industries for North Carolina. Vocational and technical schools have a responsibility to aid in the development of these skills necessary for the maintenance and development of our present industries as well as preparing for new industries. Schools cannot be operated without competent teachers. It is to prepare teachers for this field of service that this program is designed. A four-year course is outlined with the first two years running parallel with that of Industrial Arts, then specializing by following the outlined course during the last two years.

Positions for Graduates.—The student who completes this course will be prepared to teach in the all-day trade schools, area vocational schools, the part-time, or the evening vocational classes, such as are supported by State and Federal funds for vocational education. At the present time, little difficulty should be encountered by the successful candidates in attaining positions after graduation.

Trade Experience Required.—Candidates for degrees must have had at least two years of successful trade experience in the trade they wish to teach. Successful completion of this course leads to the degree of Bachelor of Science in Industrial Education. Students desiring this degree may enter with or without having the required practical experience. If the student does not have any trade experience when he enters, he must meet this requirement before getting the degree, either by working parts of the school year or by completing the work experience after completing the required resident courses.

This Department is recognized as the official Training Department of Industrial Education for the State Department of Education. The head of the Department serves as itinerant teacher-trainer for part-time, day-trade, and evening classes, and for the preparation of prospective teachers.

CURRICULUM FOR TEACHERS OF INDUSTRIAL EDUCATION

For freshman and sophomore years, see Industrial Arts Education

Junior Year

COURSES	CREDITS First Term	Second Term	Third Term
Philosophy of Industrial Education, Ed. 427	0	3	0
*Shopwork (selected)	3	3	3
Introduction to Psychology, Psychol. 200, Educational Psychology, Ed. 304, Psychology of Adolescence, Ed. 476	3	3	3
Principles of Guidance, Ed. 420	0	0	3
Problems in Secondary Education, Ed. 344	3	0	0
Labor Problems, Econ. 331	3	0	0
General Economics 201, 202, 203	3	3	3
Visual Aids, Ed. 308	0	0	3
Mechanical Drawing, M.E. 211, 212, 213	2	2	2
**Electives	3	3	3
Electives	0	3	0
	20	20	20

Senior Year

	CREDITS		
	First Term	Second Term	Third Term
Local Survey: Planning a Program, Ed. 416	0	3	0
*Shopwork (selected)	0	3	0
Methods of Teaching Industrial Subjects, Ed. 422	3	0	0
Observation and Directed Teaching, Ed. 444	0	3	3
Occupational Studies, Ed. 424	0	0	3
Curriculum Problems in Industrial Arts, Ed. 482, Instructional Aids and Devices, Ed. 483, Laboratory Planning and Equipment Selection, Ed. 484	3	3	3
***Elective courses in Design	3	3	3
**Electives	3	3	0
Electives	5	0	6
	17	18	18

* Elective shopwork should be taken in fields available as Textiles, Woodshop, Machine Shop, Foundry, and Electricity.

** To be selected from the following fields: Humanities, Military Science III and IV, Language and Literature, Pure Mathematics, Pure Natural Science and Social Science.

*** Elective courses must be approved by the faculty adviser.

INDUSTRIAL AND RURAL RECREATION

Associate Professor Thomas I. Hines, Head of Department

Industrial and rural recreation is a program of organized leisure time activities promoted and conducted by either an industrial unit for the welfare of its employees and their families or by an agency serving a rural area. Many industries, communities, and agencies (public and private) furnish elaborate recreation facilities. The demand for trained recreation leadership has increased with great strides in recent years. This demand exceeds by far the supply of qualified leadership to be furnished by our colleges and universities. North Carolina State College is fulfilling its obligations to North Carolina by providing a Curriculum of Industrial and Rural Recreation whereby qualified leadership is made available to industrial units and communities of North Carolina.

Purposes.—The Curriculum of Industrial and Rural Recreation is provided to equip the student with the necessary essentials demanded of a recreation executive who must originate, organize, promote, and administer a comprehensive program of recreation. It makes available sufficient elective courses to meet the student's needs and satisfy his desire to receive training related to recreation; thereby the student increases his possibilities of employment in fields closely allied with industrial and rural recreation.

The first two years of work in this curriculum includes studies of a general and foundational nature coupled with orientation and introductory courses related to industrial and rural recreation. The junior and senior years are planned to include experiences of a specialized professional nature.

In addition to faculty, facilities have been provided to make the curriculum function efficiently. Further increases in physical setting and equipment are planned which will give North Carolina State College the opportunity to acquire and maintain a leading role in the training of qualified leaders of industrial and rural recreation and its associated fields.

CURRICULUM OF INDUSTRIAL AND RURAL RECREATION

Freshman Year

COURSES	Terms and Credits F	W	S
Composition, Eng. 101, 102, 103	3	3	3
Algebra, Trignometry, Math. of Finance, Math. 111, 112, 113	4	4	4
General Inorganic Chemistry, Chem. 101, 102, 103	4	4	4
Introduction to Physical Education, Rec. 101	3	0	0
Gymnastics and Stunts, Rec. 102	0	3	0
Theory of Play, Rec. 103	0	0	3
United States History, Hist. 121, 122	3	3	0
American Government, Pol. Sci. 211	0	0	3
*Military Science I, Mil. 101, 102, 103	2	2	2
Physical Education and Hygiene, P.E. 101, 102, 103	1	1	1
	20	20	20

Sophomore Year

Principles of News and Article Writing, Eng. 215	3	0	0
Public Speaking, Eng. 231	0	0	3
Business English, Eng. 211	0	3	0
General Sociology, Soc. 202, 203	3	3	0
Zoology, Zool. 101, 102	4	4	0
Human Physiology, Zool. 113	0	0	3
Survey of Agricultural Industries, Agr. Econ. 221	3	0	0
Survey of Engineering and Industrial Processes, Ind. Eng. 204	0	3	0
Survey of Textile Industries, Tex. 237	0	0	3
Games of Low Organization, Rec. 201	0	3	0
General Economics, Econ. 201, 202, 203	3	3	3
*Military Science II, Mil. 201, 202, 203	2	2	2
Physical Education, P.E. 201, 202, 203	1	1	1
Introduction to Psychology, Psychol. 200	0	0	3
	19	22	18

Junior Year

Recreational Facilities and Equipment, Rec. 304	0	3	0
Introduction to Community and Industrial Recreation, Rec. 302	3	0	0
Human Behavior. Soc. 301	3	0	0
Psychology of Personality, Psychol. 290	0	3	0
Social Psychology, Psychol. 390	0	0	3
Industrial Relations, Econ. 332	0	3	0
Principles of Physical Education, Rec. 301	3	0	0
Recreational Arts and Crafts, Rec. 308	0	0	3
Leadership, Soc. 403	0	0	3
Dual and Single Games, Rec. 303	3	0	0
Group Games of High Organizations, Rec. 305, 306	0	3	3
Personal and Community Hygiene, Rec. 307	0	0	3
(Supervised Practice in Industrial or Community Recreation, Rec. 309, 8 weeks in Summer—6 credit hours.)			
**Electives	6	6	6
	18	18	21

Senior Year

Organization and Administration of Recreational Activities, Rec. 402	0	3	0
Industrial Psychology, Psychol. 338	0	0	3
Social Recreation, Rec. 404	0	0	3
Sociology of City Life, Soc. 402	3	0	0
Industrial Sociology, Soc. 410	0	3	0
Industrial Management, Econ. 325, 326	3	3	0
Personnel Management, Econ. 333	0	0	3
Principles and Practices in Industrial Recreation, Rec. 401	3	0	0
Principles of First Aid and Safety, Rec. 403	0	3	0
**Electives	9	9	9
	18	21	18

Total hours required—239 including 6 credit hours of supervised practice.

*Or six credits in one or two of the following departments: Economics, Ethics and Religion, History and Political Science, Modern Languages, Psychology and Sociology.

**To be selected from the following fields: Humanities, Mil. III and IV, Languages and Literature, Pure Mathematics, Pure Natural Science, Social Science.

Note: No student will be graduated in this curriculum prior to 1951.

OCCUPATIONAL INFORMATION AND GUIDANCE

Professor Roy N. Anderson, Head of Department

Special facilities are provided in the Division of Teacher Education for mature students and persons who have had teaching or personnel experience and hold a Bachlor's Degree to enroll for courses leading to a Master's Degree in Occupational Information and Guidance. Advanced courses in education, psychology, and economics will be selected according to the individual needs of students so as to prepare them for competent leadership in guidance and counseling techniques. In addition to the Master's Degree the courses are so designed as to meet the requirements for State Counselors' certificates.

DEPARTMENT OF PSYCHOLOGY

Professor Dannie J. Moffie, Head of Department
* Professor A. D. Grinsted
** Professor Key L. Barkley
Assistant Professors J. C. Johnson, **William Westberg
† Part-time Instructors Michael Caffey, Wilbert Edgerton

The Department of Psychology, in view of its intimate relation to the problems of Teacher Education, is incorporated administratively in the Division of Teacher Education; at the same time it functions instructionally throughout the Basic Division and the Professional Schools.

Objectives: The primary objectives of this department are: (1) to provide students in general with an appreciation and understanding of human behavior, (2) to provide students in the various technological curricula with specialized instruction in applied, industrial, and social psychology, (3) to provide students in education with general principles of instruction, learning and personality development.

The Department of Psychology also operates a Psychological Clinic which provides individual testing and counseling services to students. Special problems in academic, personal, social and vocational areas are handled. This service is closely integrated with the college counseling program. Tests of intelligence, aptitudes, personality, interests, and educational achievement are administered for individual diagnosis.

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* Resigned July, 1948.
** Appointment effective 1948-49.
† Resigned Sept. 1948.

THE SCHOOL OF TEXTILES

Malcolm E. Campbell, Dean
Thomas Nelson, Dean Emeritus

Organization.—The School of Textiles of North Carolina State College is organized for the purpose of administration into six departments: Yarn Manufacturing, Knitting, Fabric Development Construction, Textile Chemistry and Dyeing, Synthetics and Textile Research.

The School of Textiles is organized to offer technical instruction, both undergraduate and graduate, in the applied sciences underlying the production and finishing of textile products. This training is supplemented by thorough academic and engineering training in the other branches of the college. It is also organized and equipped to conduct applied and fundamental textile research and cooperates with other Schools of the College and with research organizations throughout the country.

Purpose.—The purpose of the School of Textiles is to educate men for professional service in Textile Manufacturing, Textile Management, Textile Chemistry and Dyeing, Yarn Manufacturing, Knitting, Weaving and Designing and Synthetics; to develop their capacities for intelligent leadership; to equip them to participate in commercial and public affairs; to aid in the development of the textile industry and its commerce through research and experimentation; to cooperate with the textile mills of the State in gaining, through scientific research, information that will improve the quality and value of manufactured products and increase technical skill.

Occupations.—Never before in America have more opportunities in textiles been offered to young people of North Carolina and the South generally than are available today to graduates of the School of Textiles.

North Carolina is the largest textile manufacturing State in the South; it has more mills than any other State in America. It has the largest towel, damask, denim, and underwear mills in America; and it has more mills that dye and finish their own products than any other Southern State, also a large printing industry. These plants produce a diversified line of cotton, rayon, silk, wool, and worsted textile products.

The courses of instruction are arranged and grouped so that students may get the best results from their work, and accumulate the necessary knowledge, which, together with actual experience after graduation, enables them to fill such positions as the following:

Owners of mills.

Presidents and vice-presidents of mills and other textile establishments.

Secretaries and treasurers of mills.

Managers, superintendents, and department foremen in cotton, rayon, woolen, silk, and hosiery mills.

Superintendents and foremen in mercerizing, bleaching, dyeing, and finishing plants.

Designers and analysts of fabrics.

Technical demonstrators in the dyestuff industry.

Textile chemists.

Textile cost accountants in mills.

Purchasing agents for mills.

Salesmen of machinery, yarn, cloth, rayon, dyestuffs, and chemicals.

Positions in yarn and fabric commission houses, with fabric converters and with research organizations.

Specialists in Government service.

Representatives for manufacturers of machinery, rayon, dyestuffs, and mill supplies.

Degrees.—Upon the completion of any one of the curricula in Textiles the degree of Bachelor of Science in Textiles is conferred.

The degree of Master of Science in Textiles is offered for the satisfactory completion of one year of graduate study in residence. Candidates for the degree of Master of Science in Textiles enter and are enrolled in the Graduate Division of the College.

Requirements.—The requirements for graduation in the School of Textiles are the satisfactory completion of all the courses in one of the prescribed curricula on the pages following. A total of not fewer than 240 term credits, with not fewer than 240 honor points are required in each curriculum.

Inspection Trips.—Where possible arrangements are made for students to visit outstanding mills. These trips are made to enable the student to see various manufacturing processes under actual operating conditions.

Curricula.—Two curricula, Textile Manufacturing, and Textile Chemistry and Dyeing, are offered in the School of Textiles. The freshman year is the same in both. Six options are provided for seniors in the Textile Manufacturing curriculum which permit the student to specialize in a chosen field. The options include groups of related courses which represent, in each case, a total of twenty-seven credits. The options are: Synthetics, General Textiles, Yarn Manufacturing, Textile Management, Knitting, and Weaving and Designing.

Students who select Textile Chemistry and Dyeing or Textile Manufacturing with option in Knitting, Synthetics, Weaving and Designing, or Yarn Manufacturing devote a larger percentage of their time to specialization in one Department of the School of Textiles.

Textile Curricula for University and College Graduates. Selected courses leading to the degree Bachelor of Science in Textiles are offered to graduates of universities and standard colleges. These are arranged in accordance with the vocational aim of the individual student and in the light of credits presented from the institution by which the student has been graduated, subject to the approval of his adviser and the director of instruction. In cases where the student presents enough credits which may be used for courses required in a curriculum, he or she may be graduated with a Bachelor of Science degree in Textiles. In no case should it take more than two years to complete the work for the degree.

Short Courses.—It is the policy of the School to offer short course training for textile mill men who have a limited amount of time to spend at the School. These courses can be offered when a demand for them exists and the subject matter will be selected to meet the needs of the group.

Extension Courses.—The staff of the School is cooperating with the Extension Division of the College in offering textile courses by correspondence to employees of textile mills who wish to engage in this type of study. Applications for enrollment in these courses should be mailed direct to the Bureau of Correspondence Instruction, Edward W. Ruggles, Director, State College Station.

DEPARTMENTS

YARN MANUFACTURING

Professor Elliot B. Grover, Head of the Department
Professor J. T. Hilton
Assistant Professor P. T. Biggers
Assistant Professor W. A. Thomason, Jr.

Purpose.—The purpose of this Department is to instruct students in the theory and practice of producing yarns to conduct experimental processing in the utilization of cotton and the various synthetic fibers, and combinations of these; to study the engineering aspects of the machinery involved, and to cooperate with mills in solving manufacturing problems through research and experimentation.

Opening and Picking.—The opening and picking equipment is placed in a separate room and consists of bale breaker, vertical opener, C.O.B. and condenser, distributor breaker picker, and finisher lapper.

Carding and Spinning.—This equipment occupies two rooms. The larger one is used for instruction. The machinery consists of cards, regular and controlled-draft drawing frames, conventional and long draft roving frames, spinning frames, warper, spooler, winders, regular and fancy twisters, and a complete unit of combing machinery for the production of fine yarns. The smaller room contains a complete unit of carding and spinning machinery, including several types of long-draft spinning; it is used as an experimental laboratory. Thus student instruction and experimental work do not conflict. Both rooms are equipped with Parks-Cramer humidifiers.

Woolen.—This equipment, placed in a separate room and consists of a complete woolen unit made by Davis and Furber.

Mill Control Laboratory.—This laboratory is set up and equipped for the performance of physical tests on fibers, yarns, and fabrics. It has the most modern type of air conditioning designed specifically for the control of the dry bulb temperature and relative humidity within close tolerances and over a wide range of conditions.

This laboratory is used for teaching, physical testing and research.

Included in the laboratory equipment are the following: Suter-Webb fiber sorter, Pressley fiber strength instrument, several torsion and other types of balances, several combination skein and cloth breaking machines, inclined plane testers, single strand testers, Moscrop multiple and single strand tester, Mullen bursting strength tester, dry-ovens, abrasion machines, twist testers, densometers, hydrostatic pressure tester, microscopic equipment, automatic reels, Frazier air permeability tester, yarn quadrants, and many other types of laboratory equipment.

The curriculum in Yarn Manufacture is listed with the other Textile curricula.

KNITTING

Professor W. E. Shinn, Head of the Department
Associate Professor J. G. Lewis
Assistant Professor C. E. Johnson

Purpose.—In recognition of the great importance of knitting and the other needle arts in the industrial life of this section, a department of knitting has been set up with the objective of making available to this branch of the textile industry, personnel more adequately trained in the fundamentals and practices underlying the production of knitted textiles.

The laboratories of this division are being set up to embrace every phase of the knit-goods industry:

1. Circular hosiery design and knitting.
2. Circular body knitting for jersey and rib fabrics.
3. Selected types of flat knitting equipment.
4. Hosiery and knit-goods finishing, in cooperation with the Department of Textile Chemistry and Dyeing.

The wide range of equipment in the knitting laboratories makes them the outstanding center for instruction in the many aspects of knit-goods production. The knitting department functions not only to provide instruction to students in all textile curricula, but in addition offers a complete curriculum in knitting which enables students to specialize in the knitting branch of the textile industry.

In cooperation with the Department of Textile Research, a program applicable to the specific needs of the knitting industry has been initiated.

FABRIC DEVELOPMENT AND CONSTRUCTION

Professor Benjamin L. Whittier, Head of the Department
Professor Thomas Nelson
Associate Professor J. A. Porter, Jr.
Assistant Professor W. E. Moser

Purpose.—The purpose of this Department is to instruct students in the theory and practice of weaving and designing fabrics ranging from simple print cloths to elaborate leno and jacquard creations, to coöperate with the home economics department of North Carolina colleges in creating consumer interest in textile products, to coöperate with mills in solving manufacturing problems through research and experimentation.

Weave Room.—This room contains a larger variety of looms than can be found in any textile mill. These have been carefully selected so that the students may obtain a knowledge of the different cotton, rayon, and silk looms made in the United States. It also contains looms to produce such fabrics as print cloths, sheetings, denims and twill fabrics, ginghams, fancy shirtings, dress goods, and plush, as well as fancy leno and jacquard fabrics. The weave room has been modernized so that the students can be trained in the technique of manufacturing fancy cotton, rayon, and combination fabrics on automatic, dobby, and jacquard looms. Other equipment in the weave room includes Universal filling winders, braiders and Bahnson humidifiers.

Warp Preparation.—Short warps are made on the silk and rayon equipment in this department, which consists of a silk and rayon skein winder, and a combination warper and beamer. Other equipment includes a slasher and cotton beaming frame.

Designing and Fabric Analysis.—A full equipment of design boards for single and double cloths is provided in the classrooms. Dies for cutting samples and different makes of balances, and microscopes are provided for the analysis of fabrics. Other designing equipment includes an enlarging camera, card cutting pianos and card lacing equipment.

The curriculum in Weaving and Designing is listed with the other Textile curricula.

TEXTILE CHEMISTRY AND DYEING

Professor Henry A. Rutherford, Head of the Department
Professor A. H. Grimshaw
Associate Professor A. C. Hayes

Purpose.—The purpose of this Department is to instruct students in the chemistry of natural and synthetic fibers, and in the theory and practice of scouring, bleaching, dyeing, finishing, and printing of yarns and fabrics; to conduct laboratory experimental work demonstrating the principles set forth in lecture periods; to cooperate with the mills of the State in solving problems relating to the chemical processing of textile materials.

Equipment.—The department has the necessary laboratory equipment and apparatus for student experimental work on the chemical properties of fibers, and on the various processes used in dyeing, finishing and printing. In addition, a few pieces of larger-scale equipment are available to demonstrate mill operations in kiering, and in the dyeing of yarn, cloth and hosiery. The usual machines for the evaluation of dyes and finishes by accelerated tests are also available.

Adequate facilities are available for students in microscopy, including a dark room fully equipped for photographic work.

The department expects to greatly increase its equipment during the next few years. The expansion program contemplates the procurement of a complete laboratory-scale finishing range, as well as additional plant-scale equipment, and the installation of two new chemical laboratories, one a research laboratory for use by the staff and graduate students, and the other a laboratory for students in chemical testing and advanced dyeing.

The curriculum in Textile Chemistry and Dyeing is listed with the other Textile curricula. Changes in the requirements for students selecting this option may be anticipated from time to time in order that the academic training may be kept abreast of modern developments in the application of chemistry to textile materials.

TEXTILE RESEARCH

Professor J. F. Bogdan, Head
Mrs. Martha Wallace Kerr, Laboratory Technician
Mr. Peter Bachinger, Research Assistant

Through financial assistance extended by the North Carolina Textile Foundation, a program of research has been initiated which is expected to be far reaching in its influence on the development of the textile industry in North Carolina and the nation.

The scope of this research will embrace fundamental and applied investigations in the fields of fibers, yarn fabrics and fabrication.*

The equipment available for research is listed under the departments. Members of the teaching staff devote a portion of their time to research. Their work is being supplemented by full time research personnel trained in the physical sciences.

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* With particular reference to the choice and use of modern resources in fibers and finishes to produce textiles best adapted to their purpose, as determined by the study of performance in consumer use.

SYNTHETIC FIBERS DEPARTMENT

Professor H. B. Garden, Head of Department

Purpose.—The purpose of this department is to acquaint students with the various types of synthetic yarn, and to instruct in the basic properties, handling methods, and conversion into representative end products of each. The department acts in conjunction with the knitting, yarn manufacturing, weaving, textile chemistry, dyeing, and research departments of the Textile School to provide a broad ground work in synthetic yarn fundamentals.

Equipment and Laboratory.—In the student practice unit complete facilities for conversion of continuous filament yarns of all types are being installed to augment and supplement existing Textile School equipment. Cotton and silk system warping, yarn sizing, single and ply twisting, tricot beam preparation, weaving, and fabric inspection machinery is being installed.

The Synthetic Fiber option is listed with other options.

MACHINE DESIGN AND DEVELOPMENT

C. M. Asbill, Jr., Head
E. Cox, Toolmaker

Purpose.—The purposes of this Department are as follows:

1. To develop new types of textile machinery and to improve existing types.
2. To keep abreast of modern developments in machines and testing equipment by a digest of patents and through technical articles in the various textile publications, as well as by close contacts with mills and machine manufacturers.
3. To furnish engineering assistance and advice relating to patents to individuals and organizations interested in the design or development of textile machines or related apparatus.
4. To place within reach and at the disposal of interested students and the teaching and research staff of the School, the facilities of a qualified textile engineering department with means for the construction and testing of new or improved equipment.

Equipment.—The facilities consist of design and drafting equipment together with a completely equipped machine shop for the production of both large manufacturing devices and smaller and more delicate testing apparatus. The machine tools include three modern lathes from 9" to 24" swing, a milling machine, a shaper, a surface grinder, drill presses, a metal cutting band saw, electric and gas welding apparatus and miscellaneous small tools and equipment.

The establishment of this Department within the School of Textiles was made possible by the financial assistance of the N. C. Textile Foundation.

Its functions will extend to all phases of textile manufacturing and processing including both the mechanical and electrical fields. Patents will be secured on all worthwhile developments and administered in accordance with the Patent Policy of the College.

TEXTILE LIBRARY

Katharine McDiarmid, Librarian

The Textile School has a technical library located on the main floor near the business office. The library was organized in 1944 and in June, 1945, the entire textile collection from the D. H. Hill Library was added to it. There are now about 2000 volumes of which 1000 are bound periodicals. The library subscribes to 75 current periodicals, both American and foreign, which are very thoroughly indexed in **Industrial Arts Index, Chemical Abstracts, Natural and Synthetic Fibers,** and **Textile Technology Digest.**

In addition to books and periodicals, the librarian and student assistants maintain files of pamphlets, reprints, trade catalogs, and patents. Special card indexes have been prepared for these collections.

The holdings of the Textile Library are available on loan not only to students and faculty of the college, but also to research workers and industrial employees throughout North Carolina.

CONSULTING SERVICE

George H. Dunlap, Technologist

In recognition of the need for close contact with the textile mills, this division was organized with the assistance of the North Carolina Textile Foundation. It is the function of the Technologist to visit as many mills as possible during the year, to discuss with executives their technical problems, and assist in their solution. In many cases, this involves experimental work which may be conducted in the mill or brought to the School for consultation with the staff or for special work in the laboratories.

The Technologist frequently cooperates with the officials of trade associations in planning and arranging programs and represents the School at these meetings.

SPONSORED PROFESSORSHIPS

Three sponsored professorships are now in effect in the School of Textiles. These are made possible by funds contributed to the North Carolina Textile Foundation, Inc., and especially designated to pay a part of the annual salary of the professor selected to fill the position.

The three professorships, together with the year of establishment and the name of the incumbent for each are as follows:

Burlington Mills Professorship of Synthetic Fibers (1946)—Harry B. Garden, Professor of Textiles and Head, Department of Synthetic Fibers.

Edgar and Emily Hesslein Professorship of Fabric Development and Construction (1948)—Benjamin Lincoln Whittier, Professor of Textiles and Head, Department of Fabric Development and Construction.

Chester H. Roth Professorship of Knitting (1948)—William Edward Shinn, Professor of Textiles and Head, Department of Knitting.

CURRICULUM IN TEXTILE MANUFACTURING

Freshman Year

(For All Textile Students)

COURSES	CREDITS First Term	Second Term	Third Term
General Inorganic Chemistry, Chem. 101, 102, 103	4	4	4
Algebra, Trigonometry, Analytics, Math. 101, 102, 123	4	4	4
English Composition, Eng. 101, 102, 103	3	3	3
Engineering Drawing, M.E. 101, 102, 103	2	2	2
Textile Principles, Tex. 108	0	3	0
Cloth Calculations, Tex. 131	0	0	3
Decorative Drawing, Arch. 106	3	0	0
Physical Education, P.E. 101, 102, 103	1	1	1
*Military Science, Mil. 101, 102, 103	2	2	2
	19	19	19

Sophomore Year

(For all Textile Students except those in Textile Chemistry and Dyeing)

Physics, Phys. 111, 112, 113	4	4	4
Economic History, Hist. 101, 102, 103	3	3	3
General Economics, Econ. 201, 202, 203	3	3	3
English or Modern Language,	3	3	3
Yarn Manufacture II, Tex. 206	0	0	4
Power Weaving, Tex. 233, 234	2	2	0
Knitting, Tex. 261, 267, 268, 269	3	1	1
Fabric Structure, Tex. 237	0	2	0
Sports Activities, P.E. 201, 202, 203	1	1	1
*Military Science, Mil. 201, 202, 203	2	2	2
	21	21	21

Junior Year

Psychology or Accounting, Psy, 200, 337, 338, or Econ. 301, 302, 303	3	3	3
Industrial and Personnel Management, Econ. 325, 326, 333	3	3	3
Fiber Quality, Tex. 420, 421	0	3	3
Hosiery Manufacture, Tex. 477	3	0	0
Dobby Weaving, Tex. 335, 336	0	3	3
Fabric Design and Analysis, Tex. 341, 342	3	3	0
Yarn Manufacture III, Tex. 307, 308	3	0	3
Textile Dyeing, T.C. 301, 302, 303	3	3	3
**Electives	3	3	3
	21	21	21

Senior Year

***Textile Cost Methods, Tex. 475	0	0	3
Mill Organization, Tex. 426, 427	0	3	3
Textile Testing I, Tex. 316, Chemical Testing T.C. 311 and Microscopy, T. C. 410	2	2	2
Instrumentation, Tex. 499	0	3	0
Wool Manufacturing, Tex. 416 or Synthetics I, Tex. 490	3	0	0
SELECTED OPTION (27 Credits in General Textiles, Management, Weaving and Designing, Synthetics, Knitting, or Yarn Manufacturing) See Options	9	9	9
**Electives	3	3	3
	17	20	20

*Or six credits in one or two of the following departments: Economics, English, Psychology, History and Political Science, Modern Languages, Sociology, and Ethics and Religion.

**To be selected from the following fields: Humanities, Military Science III and IV, Languages and Literature, Pure Mathematics, Pure Natural Science and Social Science.

***Students in Management Option will substitute an approved textile course.

OPTIONS

Synthetics Option

COURSES	CREDITS First Term	Second Term	Third Term
Synthetics II, Tex. 491, 492, 493	3	3	3
Synthetic Fiber Processing, Tex. 404	3	0	0
Wool Manufacture I, Tex. 416 or Synthetics I, Tex. 490	0	3	0
Yarn Technology, Tex. 424	0	0	3
Textile Courses	3	3	3
	9	9	9

General Textiles Option

Synthetics I, Tex. 490 or Wool Manufacture I, Tex. 416	0	3	0
Yarn Manufacture IV, Tex. 407, 408	3	3	0
Dobby Design, Tex. 443	3	0	0
Fabric Analysis, Tex. 451	2	0	0
Cotton and Rayon Weaving Lab. II, Tex. 437	2	0	0
Fabric Technology, Tex. 345	0	0	3
Textile Courses	2	3	3
	12	9	6

Yarn Manufacturing Option

Synthetics I, Tex. 490 or Wool Manufacturing, Tex. 416	3	0	0
Yarn Manufacture IV, Tex. 407, 408	3	3	0
Synthetic Fiber Processing, Tex. 404	0	3	0
Yarn Technology, Tex. 424	0	0	3
Yarn Manufacturing Project, Tex. 415	0	0	3
Textile Courses	3	3	3
	9	9	9

Textile Management Option

Cost Accounting, Econ. 404, 405	3	3	0
Marketing Methods and Sales Management, Econ. 311, 312, 313	3	3	3
Textile Courses	3	3	6
	9	9	9

Knitting Option

Flat Knitting, Tex. 468	3	0	0
Knitting Lab. II, Tex. 463, 464, 465	2	2	2
Knitted Garment Manufacture, Tex. 469	0	0	3
Knitting Mechanics, Tex. 460	0	3	0
Knitted Fabric Design, Tex. 371, 372	2	2	0
Full-fashioned Hosiery Knitting, Tex. 471	0	0	2
Knitting Lab. III, Tex. 473, 474, 475	2	2	2
	9	9	9

Weaving and Designing Option

Dobby Design, Tex. 443, 444	3	3	0
Fabric Analysis, Tex. 451	2	0	0
Jacquard Design, Tex. 445	0	3	0
Jacquard Design and Weaving, Tex. 446	0	0	3
Cotton, Wool and Rayon Weaving, Tex. 435	0	0	3
Color in Woven Design, Tex. 455	3	0	0
Fabric Technology, Tex. 345	3	0	0
Cotton, Wool and Rayon Weaving Laboratory, Tex. 437, 438	2	2	0
	13	8	6

CURRICULUM IN TEXTILE CHEMISTRY AND DYEING

(The freshman year is the same as for Textile Manufacturing)

Sophomore Year

COURSES	CREDITS First Term	Second Term	Third Term
English or German	3	3	3
Economic History, Hist. 101, 102, 103	3	3	3
Physics, Phys. 111, 112, 113	4	4	4
Textile Yarns, Tex. 203	0	0	3
Power Weaving I, Tex. 231, 232, 234	2	2	0
Fabric Structure, Tex. 235	0	2	0
Organic Chemistry, Chem. 421, 422, 423	5	5	5
Sports Activities, P.E. 201, 202, 203	1	1	1
*Military Science, Mil. 201, 202, 203,	2	2	2
	20	22	21

Junior Year

General Economics, Econ. 201 202, 203	3	3	3
Industrial and Personnel Management, Econ. 325, 326, 333	3	3	3
Quantitative Analysis, Chem. 211, 212	4	4	0
Fiber Quality, Tex. 420, 421	0	3	3
Textile Testing I, Tex. 316, Chemical Testing, T.C. 311, and Microscopy, T.C. 410	2	2	2
Knitting, Tex. 267, 261	1	0	2
Textile Chemistry and Dyeing, T.C. 305, 306, 307	4	4	4
**Electives	3	3	3
	20	22	20

Senior Year

Fabric Finishing, T.C. 411	4	0	0
Textile Printing, T.C. 414, 415	0	3	3
Advanced Dyeing, T.C. 405, 406, 407	4	4	4
Colloid Chemistry, Chem. 442	0	3	0
Insturmentation, Tex. 499	3	0	0
Chemistry of Natural and Synthetic Fibers, T.C. 420	0	3	0
**Electives	3	3	3
***Electives	6	6	6
	20	22	16

*Or six credits in one or two of the following departments: Economics, English, Psychology, History and Political Science, Modern Languages, Sociology, and Ethics and Religion.

**To be selected from the following fields: Humanities, Military Science III and IV, Language and Literature, Pure Mathematics, Pure Natural Science, and Social Science.

***Chemistry, Textiles, Mathematics or Statistics.

The Graduate School of the University of North Carolina

STATE COLLEGE DIVISION

William Whatley Pierson, Jr., Dean, Chapel Hill
Zeno Payne Metcalf, Associate Dean of the Graduate School, Raleigh

Organization

Purposes.—Graduate Instruction at State College is organized to formulate and develop graduate study and research in the fields primarily of Agriculture, Engineering, and Textile Manufacturing, and in the training of teachers of these subjects. The urgent need for graduate instruction leading to research in these fields is recognized by the leaders in the occupations which depend upon the development of these branches of industry. State College, therefore, offers training for teachers, investigators, and leaders in Agriculture, Engineering, and Manufacturing. Moreover, unless graduate study and research in the technological and related fields are provided, the institutions of higher learning in this section of the country will look elsewhere for trained men, whereas there should be a fair balance of such men from every section of the country.

Facilities.—State College offers exceptional facilities and opportunities for research. The Agricultural Experiment Station of North Carolina, the Engineering Experiment Station, and the Research Laboratories of the Textile School are integral parts of the College. In the Textile School, besides the research carried on by regular members of the staff, the Bureau of Agricultural Economics and other Bureaus at Washington have, for some years, used the facilities of the School for special research. Graduate students have the advantages offered by all these agencies in addition to the regular laboratories used for instruction.

In its undeveloped resources and raw materials, as well as in its going concerns in business and industry, in its varied topography and products, North Carolina is a rich field for research. The State is already imbued with a spirit of progress stimulating to intellectual growth.

Scholarships and Fellowships.—The College offers annually graduate fellowships and a number of teaching and research fellowships. Besides these, special fellowships are supported by various commercial organizations.

College Fellowships give tuition and a stipend of $450 an academic year, paid in nine equal installments, a month apart, beginning October 25. The holder of a fellowship may be required to render a maximum of ten hours a week of service to the Department in which he is specializing.

Teaching and Research Fellowships give $900 or more an academic year. The holder of one of these fellowships may not carry more than half of a full schedule of graduate studies. The rest of his time must be given to teaching in classroom or laboratory, or to research in one of the Experiment Stations.

The Honor Society of Phi Kappa Phi Fellowship, State College Chapter, offers $50 annually, preferably to a member of the Society, to assist in promoting research, and advanced training of worthy students.

Special Fellowships have for some years been maintained by business or manufacturing organizations desirous of having research made on certain problems pertaining to their interest. Some organizations maintaining these scholarships have been the National Fertilizer Association, the N. V. Potash Export My., the American Cyanamids Company, the Superphosphate Institute, E. I. DuPont de Nemours and Company, the Niagara Sprayer and Chemical Company, Eli Lilly and Company, the American Potash Institute, and the Northwestern Yeast Company. The stipends afforded by these fellowships have varied from $720 to $1,500 for twelve months. It is hoped that some of these may be available every year.

DEGREES

The degrees awarded by the Graduate Division of State College are either degrees in residence: Master of Science in some specialized branch of Agriculture, Education, Engineering, and Textiles; and the Master's degree in some profession related to the undergraduate work at State College; or Professional degrees in the fields of Agriculture, Engineering and Textiles.

A graduate student is expected to familiarize himself with the requirements for the degree for which he is a candidate and is held responsible for the fulfillment of these requirements. This applies to the last dates on which theses may be accepted, the dates for examination, the proper form for theses and all other matters regarding requirements for degrees.

Degrees in Residence

Admission

1. A candidate for admission to graduate study must hold a bachelor's degree from a college whose standards are equivalent to those of State College. He must submit official transcripts from all colleges previously attended when applying for admission.
2. The application must be on file with the Associate Dean at least thirty days in advance of the registration date for the term in which the student wishes to enroll in the Graduate School.
3. The Office of Registration must have a written authorization from the Associate Dean of the Graduate School before any graduate student will be given a permit to register. This permit will be sent by the Associate Dean at the time the student is notified of his acceptance. In the future, no new graduate student will be accepted who has not applied and filed transcript three weeks before the date of registration. This will apply equally to new staff members who wish to take graduate work.
4. It should be clearly understood that admission to the Graduate Division does not necessarily admit a student to full graduate status. A student attains full graduate status only when he has fulfilled all the preliminary re-

quirements of the degree which he seeks and the prerequisites of the department under whose direction he is pursuing graduate work.

Department prerequisites are determined jointly by the Administrative Board of the Graduate Division and the heads of the respective departments. In brief, it may be stated that such prerequisites usually consist of the equivalent of an undergraduate major.

5. A member of the senior class of State College may, upon approval of the Associate Dean of the Graduate School, register for courses in the 400 group for graduate credit, to fill a roster of studies not to exceed 15 credits in any term. Permission will not be given to take such courses in the major subject, but only in the minor or related subjects. Under no circumstances may an undergraduate receive credit for a course number 500.

6. Members of the faculty of State College having a rank higher than that of instructor may not be considered as candidates for advanced degrees at this institution.

Master of Science Degree

The Master of Science Degree is awarded at State College after completion of a course of study in a specialized field related to Agriculture, Education, Engineering, or Textiles; demonstration of ability to read a modern foreign language; and completion of a satisfactory thesis and of comprehensive examinations in the chosen field of study.

The rules and requirements governing the degree of Master of Science are set forth in some detail in the following paragraphs.

In addition to complying with these purely mechanical requirements, the candidate for the Master of Science degree should understand something of the philosophy of graduate study. He is entering the field of research since he is engaged in a technical study of a single field of learning, and this study culminates in work upon a single problem, the subject of his thesis, in the solution of which he is required to give evidence of the mastery of graduate methods of investigations. He is concerned with the materials of learning, and with the organization and interpretation of these materials. Since the training is thought of as liberal, as great a latitude is permitted in the selection of courses as is compatible with the idea of a sharply defined field of major interest and with the requirement of interrelationship in the whole plan of study. The object is to make possible for the student a relative mastery of one of the applied sciences and to give him an introduction to critical scholarship and research methods. A beginning is made in the training of the specialist; hence the correlation of courses, the oral and written examinations, and the thesis. Since there are many possible combinations of courses, the method of administration provides for personal supervision of a student's work by a special committee.

Development of precision and method in investigation and the cultivation of power of criticism and evaluation of evidence, together with the enlarged mastery of the subject matter of a defined field, constitute a training of indisputable value to the students who plan to enter the so-called learned professions or industry. Research is the way of progress in each activity.

Credits.—1. For the Master of Science degree forty-five term credits are required.

2. Not more than ten of the academic credits required for a graduate degree will be accepted from other institutions.

3. No graduate credit will be allowed for excess undergraduate credit from any other institution.

4. All work credited toward a degree in residence must be completed within six years.

Residence.—A candidate for a Master of Science degree is required to be in residence at the College, pursuing graduate work, one full academic year of three terms. The candidate is not permitted to take courses leading to forty-five credits in a shorter time.

Six summer schools of six weeks in residence at the College are sufficient to fulfill the residence requirement. By specific approval of the Associate Dean of the Graduate School one summer period may be spent away from the College if devoted to the preparation of the thesis required for graduation.

In special cases, it is possible for graduate students to secure permission from the Associate Dean of the Graduate School to do twelve weeks work during a summer session. Under these provisions a minimum of four summer sessions, two of twelve weeks and two of six weeks, are required for residence.

This does not mean that the work prescribed for each individual can always be completed in the minimum length of time. Inadequate preparation very frequently makes a longer period necessary. Part-time work during a regular term is evaluated on the basis of the amount of work carried.

Courses of Study.—As designated in the College Catalog under Description of Courses, the courses numbered 500 to 599 are for graduate students only, and those numbered 400 to 499 are for graduates and advanced undergraduates.

The program of the student shall contain at least twelve credits in courses of the 500 group. A maximum of 33 credits may be gained in the 400 group.

During the first term in residence the student's program will be made up by his adviser with the approval of the chief adviser of his School and the Associate Dean of the Graduate School. Thereafter, the selection of courses shall be made by the graduate student's Advisory Committee. These advisory committees shall be appointed by the Associate Dean of the Graduate School not later than the student's second term of residence.

All study plans are subject to the approval of the Administrative Board of the Graduate Division.

The advanced courses taken by a graduate student shall constitute a unified plan of study. The greater percentage of courses on a graduate student's program shall be in his major field and the electives shall have graduate relationship to the major field.

Class Work.—Since a graduate student is mature and has demonstrated his ability and earnestness, he is expected to assume greater individual responsibility and to work in a more comprehensive manner than the undergraduate student. However, in preparation, in attendance, and in all the routine of class work, the graduate student is subject to the regulations observed in other divisions of the College.

Grades.—A minimum grade of B must be made on all courses to obtain graduate credit.

Language Requirements.—1. A reading knowledge of at least one modern foreign language is required of candidates for the Master of Science degree. The knowledge will be tested by a special examination by the Modern Language Department.

2. A candidate for a Master of Science degree is presumed to have a mastery of technical writing. Students will be required to demonstrate this proficiency before they are admitted to candidacy for a degree.

Thesis.—1. A candidate for the Master of Science degree must prepare a thesis upon a subject, approved by his adviser, in the field of the student's special work. Two copies of the completed thesis must be presented to the Associate Dean of the Graduate School at least one month before the degree is awarded.

2. Detailed instruction in the writing of the thesis will be given to the student when he is admitted as a candidate for the degree.

3. In order to be approved, a thesis must be written in correct English and scholarly form. It must demonstrate the student's ability to handle original problems and the method of development must conform to the principles of the scientific method.

Examinations.—In addition, the successful passing of a final examination is required for the Master of Science degree. It may not be taken until all other requirements, except completing the last term courses, are satisfied, but must be taken at least two weeks before the end of the term in which the degree is to be awarded. Application for the examination must be filed with the Associate Dean at least a week before it is to be taken.

The examination will be conducted by a special examining committee, which usually will be the same as the advisory committee, but is open to all members of the Graduate Faculty. The examination may be oral or written or both at the discretion of the major department and the committee. Faculty members under whom the student has worked may be invited to participate but the decision as to the candidate's fitness rests solely with the committee. Approval or disapproval shall be solely with the committee and shall be indicated by a majority vote. A report of the results of each examination, signed by the members of the committee, shall be filed with the Associate Dean. A candidate who fails the examination may not be reexamined within a period of three months, and until he has fulfilled any special requirements imposed by the examining committee. Only one reexamination is permitted.

The examinaton will cover the thesis, all course work, and related subject matter. The student should understand that it will be comprehensive and that it will test his ability to think and reason clearly.

Fees

The graduate student in residence will pay a $2.00 registration fee for each registration, $4.00 per credit hour for all courses scheduled ($6.00 for non residents of North Carolina) and $10.00 for his diploma.

Master's Degree in a Professional Field

The Master's degree was established to meet the needs of those students who expect to terminate their graduate work at the end of one year of residence or its equivalent and whose needs are not fulfilled by the requirements of the Master of Science degree.

The candidate for this Master's degree must meet all the regulations of the Graduate Division for students in residence. In addition he must fulfill the following requirements:

Course of Study.—The program of study for the Master's degree in a professional field is to be composed of those courses which best fit the professional aims of the student. At least 12 term credits are to be chosen from the group of courses numbered 500 for graduates only and the remainder from the group numbered 400 for advanced undergraduates and graduates.

Degrees.—Examples of the types of degree that may be awarded upon the completion of the course of study in a professional field are:

Master of Dairying
Master of Civil Engineering
Master of Vocational Education
Master of Yarn Manufacturing

The chief characteristic of these degrees is that the changes made in requirements permit, in greater measure, the satisfaction of what are represented as professional needs than do the requirements for the conventional Master of Science degree. The most important modification in the requirements and principles is the granting of relatively greater dispersion in programs of study than is permissible under a strict application of the principle of interrelation of subjects in a specialized field.

Language Requirements.—The candidate for a Master's degree in a professional field is exempt from the requirement of a reading knowledge of a modern foreign language.

Other Requirements.—The other requirements for the Master's degree in a professional field, especially those concerning the thesis, residence and examination are the same as for the Master of Science degree.

The Degree of Doctor of Philosophy

The Degree of Doctor of Philosophy is offered in coöperation with The University at Chapel Hill under supervision of the Graduate School of the Consolidated University of North Carolina.

The Degree of Doctor of Philosophy is offered in certain specified departments. Graduate students who expect to become candidates for the degree are already registered in the Departments of:

Agricultural Economics	Entomology
Agronomy	Plant Pathology
Animal Industry	Experimental Statistics
Rural Sociology	

Offerings will be provided in other departments as rapidly as personnel and facilities can be developed.

Information

Further information about graduate work at State College may be secured from Z. P. Metcalf, Associate Dean of the Graduate School, N. C. State College, Raleigh, N. C.

DIVISION OF COLLEGE EXTENSION

Edward W. Ruggles, Director

Purpose.—The College Extension Division is organized to carry the practical and cultural advantage of college studies to persons who cannot attend classes on the campus, and to groups and communities that may profit by the service offered through the following means.

Extension Classes are organized where at least fifteen persons are interested and willing to take up the same subject. Such matters as the distance from the college, the nature of the subject, and the availability of instructors must be taken into consideration.

Correspondence Courses for college credit are offered in Agronomy, Animal Husbandry, Horticulture, Soils, Poultry, Agricultural Economics, Rural Sociology, Chemistry, Education, Economics, English, Geology, History, Architectural Engineering, Ceramic Engineering, Mechanical Engineering, Mathematics, Modern Languages, Sociology, Safety, and Zoölogy. The list of these courses is being added to as rapidly as possible. Complete information concerning them is included in the Bulletin of Correspondence Courses.

Correspondence Courses of a practical nature are offered in Business English, Mathematics, Industrial Electricity, Land Surveying, Plumbing, Engineering Drawing, Building and Estimating, Sheet-metal Pattern Drafting, Industrial Statistics and Quality Control, Poultry, Business Law, and Vegetable Gardening. In addition, the courses in Ceramic Engineering may be taken as practical where no credit is desired.

Short Courses are offered by the College Extension Division to tie up the facilities of the several Schools of State College with the trades and industries of North Carolina into a permanent educational program. In carrying out this program, short courses of a practical nature are offered every year which are increasing in popularity. During the present school year the following short courses and institutes are scheduled: Electrical Meters and Relays, Engineers, Surveyors, Gas-Plant Operators, Water-Works Men, Retail Coal Merchants, Electrical Contractors, Building Inspectors, Animal Production, State Garden School, Dairy Production, Dairy Manufacturing, Nursery Practices, Artificial Breeding, Field Crops Production, Farm Machinery, Dairy Herd Testing, Air Conditioning, Refrigeration, Radio, Frequency Modulation, Lumber Grading, Nutrition School, and a Safety School for Truck and Bus Operators. Additional courses are being added as the demand arises.

Technical Institutes.—The Morehead City Technical Institute at Morehead City, N. C., offers a one year terminal technical course. The course is designed to train young men interested in the electrical, radio, telephone, metal working, wood-working, sheet metal, building, automotive, diesel, heating, and other industries where technical training is essential to success.

The course includes instruction in drafting, physics, electricity, radio, internal combustion engines, chemistry, materials of construction, English, and mathematics. Laboratory training is also given in welding, machine shop, sheet metal, wood-working, radio, and the internal combustion engines laboratory.

The Institute is a functional part of the North Carolina State College. It is operated by the College Extension Division under the auspices of the School of Engineering. Special catalog available on request.

College Extension Lectures by members of the faculty and concerts by the college musical organizations are available to any high school, civic club, woman's club, science club, agricultural or engineering meeting or organization, desiring to sponsor a good lecture or musical program.

Bulletins describing the various functions of the Division will be gladly supplied on request. Write to Edward W. Ruggles, Director, College Extension Division, North Carolina State College, Raleigh, North Carolina.

Full Information.—Any person interested in extension classes or correspondence courses should write to the College Extension Division, requesting the Extension Bulletin, which contains complete information concerning methods of instruction, fees, and the conditions upon which College credit will be granted.

DESCRIPTION OF COURSES

AGRICULTURE

Agr. 101. Introduction to Agriculture 1-0-0

Organization and function of agricultural institutions and agencies; North Carolina agriculture in relation to state and national problems.

Mr. Hilton.

Agr. 301. Rural Adult Education 0-3-0

A study of the major educational and service agencies designed to advance the standards of rural living. The development of agricultural problems in the United States is traced as a background for consideration of the objectives, organization, and procedures of these agencies. This is followed by a consideration of major problems in rural education and principles underlying their solution. Mr. Leagans.

Agr. 401. Principles and Techniques of Extension Education 0-0-3

A study of the background, development, and operation of the Agricultural Extension Service. Consideration is given to major events leading to the establishment of Agricultural Extension, its objectives, organization, and philosophy. Major emphasis is placed on principles underlying Extension education together with techniques of program building and teaching.

Mr. Leagans.

AGRICULTURAL ECONOMICS

Courses for Undergraduates

Agr. Econ. 202. Agricultural Economics. 3 or 3 or 3

The economics of agricultural production, the marketing of farm products, farm credit, land tenure, and other major economic problems of the farmer.

Staff.

Agr. Econ. 212. Land Economics. 0-3-0

Land economics including land classification and land use with special emphasis on forest lands; land ownership and control; the principles of land valuation; policies of land settlement and development; the taxation of forest lands. Mr. Forster.

Agr. Econ. 221. Survey of Agricultural Industries. 3-0-0

Distinctive features, type, location, size, function, and problems of the major agricultural industries in the United States. Mr. Leager.

Agr. Econ. 303. Farm Management I. 0-0-3

Prerequisites: Six hours in Economics and Agricultural Economics.

Fundamental principles of farm organization and management, factors affecting profits in farming, developing practical farm plans, use of machinery, management of labor, farm work programs, and general managerial problems. Messrs. Greene, James.

Agr. Econ. 313. Farm Accounting. 0-0-3

Prerequisites: Six hours in Economics and Agricultural Economics.

Farm accounting, preparation of inventories of farm property, simple financial statements, methods of keeping farm records, analysis and the interpretation of results obtained from farm business transactions.

Mr. Greene.

Agr. Econ. 321. Farm Appraisal. 1-0 or 1

Prerequisite: Agr. Econ. 303.

The fundamentals of farm appraisal and practical methods of evaluating farms of various types and sizes. Mr. James.

Courses for Graduates and Advanced Undergraduates

Agr. Econ. 402. Farm Cost Accounting. 0-3-0

Prerequisites: Econ. 301 and Agr. Econ. 313.

Accounting applied to farm transactions with special emphasis on the keeping and interpreting of results from cost accounts. Mr. Greene.

Agr. Econ. 411. Marketing Agricultural Products. 3-0-0

Prerequisites: Nine hours in Economics and Agricultural Economics.

Principles and practices of marketing as applied to farm products; marketing agencies, services, and appraisal of the farm marketing system.

Mr. Abrahamsen.

Agr. Econ. 412. Problems of Land Economics. 0-3-0

Prerequisites: Nine hours in Economics and Agricultural Economics.

Land classification; ownership and acquisition of land; tenancy and land ownership; the functions of the landlord and the tenant; land valuation and land speculation. Messrs. Forster, Hamilton.

Agr. Econ. 421. Marketing Methods and Problems. 0-3-0

Prerequisite: Agr. Econ. 411.

Examination of farm marketing problems and critical evaluation of marketing methods and practices. Mr. Abrahamsen.

Agr. Econ. 422. Agricultural Cooperation. 0-3-0

Prerequisite: Agr. Econ. 411.

Cooperative principles and practices, organization problems, operating practices, and cooperative law as applied to farmers' buying, selling, and service cooperatives. Mr. Abrahamsen.

Agr. Econ. 423. Farm Management II. 0-0-3

Prerequisite: Agr. Econ. 303.

The factors involved in the management and organization of typical farms in the State. Mr. Greene.

Agr. Econ. 431. Agricultural Prices. 3-0-0

Prerequisites: Nine hours in Economics and Agricultural Economics.

Behavior of agricultural prices; their relation to consumption, production of farm products, and marketing practices; methods of price analysis applied to agricultural products. Mr. McVay.

Agr. Econ. 432. Agricultural Finance. 0-3-0

Prerequisites: Nine hours in Economics and Agricultural Economics.

Financing the production and marketing of agricultural products. Consideration of farm mortgage credit and personal and intermediate credit. Mr. Leager.

Agr. Econ. 442. Cotton and Tobacco Marketing. 0-3-0

Prerequisite: Agr. Econ. 411.

Problems, methods, and practices used in the marketing of tobacco and cotton. Mr. Forster.

Agr. Econ. 462. Marketing Dairy Products. 0-3-0

Prerequisite: Agr. Econ. 411.

Channels of distribution and consumption, price plans and bases of price quotations, factors affecting efficiency of plant operation and distribution, Federal regulation of milk marketing, and a review of dairy marketing research. Mr. Cotton.

Agr. Econ. 464. Marketing Fruits and Vegetables. 0-3-0
Prerequisite: Agr. Econ. 411.
Trends in consumption and production, channels of distribution, sales methods, marketing agencies and facilities, economic implications of prepackaging, and the role of State and Federal agencies. Staff.

Courses for Graduates Only

Agr. Econ. 501. Economics of Agricultural Production. 3-0-0
Prerequisites: Fifteen hours in Economics and Agricultural Economics.
Economic theories and methods of analyses applicable to agricultural production. Mr. Forster.

Agr. Econ. 502. Farm Organization and Management. 0-3-0
Prerequisite: Agr. Econ. 501.
The extension of the economic principles discussed in Agr. Econ. 501, and their application to the problems of farm organization and management. Mr. Forster.

Agr. Econ. 503. Agricultural Finance. 0-0-3
Prerequisites: Agr. Econ. 432 and twelve additional hours in Economics.
Problems in financing agricultural production and marketing. A history of the development of financial institutions designed to serve agriculture. Mr. Leager.

Agr. Econ. 513. Cooperative Marketing Methods and Practices. 0-0-3
Prerequisite: Agr. Econ. 422.
Critical study of organization practices and operating methods followed by farmers' cooperative associations. Mr. Abrahamsen.

Agr. Econ. 521, 522, 523. Research in Agricultural Economics. 3-3-3
Prerequisites: Fifteen hours in Economics and Agricultural Economics.
A consideration of the research method and procedure now being employed by research workers in the field of Agricultural Economics, including qualitative and quantitative, inductive and deductive methods of research procedure; choice of projects, planning, and execution of the research project. Staff.

Agr. Econ. 531, 532, 533. Analysis of National Policies and Agricultural Action Programs. 3-3-3
Prerequisites: Fifteen hours in Economics and Agricultural Economics.
The need for special legislation and self-help programs for U. S. agriculture analyzed; the economics of farm relief and agricultural adjustment critically examined with regard to their effect upon national and farm income and income distribution; the international applications of U. S. agricultural policies discussed. Mr. Freund.

AGRICULTURAL ENGINEERING

Courses for Undergraduates

Agr. Eng. 202. Farm Equipment. 4 or 4 or4

Prerequisites: Math. 111 or 101.

A study of modern farm machinery, equipment and buildings for the farm. Mr. Williams.

Agr. Eng. 212. Farm Engines. 0-3-0

Prerequisites: Physics 115 or 201; Agr. Eng. 202.

The principles of gas-engine operation and their application to farm uses; selection, operation, and repair of engines. Mr. Giles.

Agr. Eng. 222. Agricultural Drawing. 0-3-0

Drawing-board work covering both freehand sketching and elementary mechanical drawing; working and pictorial drawing, lettering, maps, graphs, tracing, and blueprinting. Mr. Teter.

Courses for Advanced Undergraduates

Agr. Eng. 303. Terracing, Drainage and Irrigation. 0-0-3

Prerequisites: Soils 202 and Agr. Eng. 202.

The different methods of disposing of surplus water and the prevention of erosion. Mr. Weaver.

Agr. Eng. 313. Farm Machinery and Tractors. 0-0-3

Prerequisite: Agr. Eng. 212.

The design, construction and operation of modern labor-saving machinery for the farm. Mr. Giles.

Agr. Eng. 322. Farm Buildings. 0-3-0

Prerequisite: Agr. Eng. 202.

The design, construction, and materials used in modern farm buildings. Mr. Teter.

Agr. Eng. 331, 332. Farm-Shop Work. 3-3-0

Lecture and laboratory practice, in drafting, sharpening farm tools, making concrete, woodworking, cold-metal working, forging, soldering, and pipe fitting. Mr. Howell.

Courses for Graduates and Advanced Undergraduates

Agr. Eng. 403. Erosion Prevention. **0-0-3**

Prerequisite: Agr. Eng. 303.

The causes and effects of erosion, and the methods of conserving our greatest national resource—our fertile soil. Mr. Weaver.

Agr. Eng. 423. Farm Structures. **0-0-3**

Prerequisite: Agr. Eng. 322.

Modern building methods as applied to farm structures; the use of labor-saving barn equipment and methods of reducing labor to a minmum; the placing of the farm group in relation to topography and farm activities, for economy, appearance, and utility. Mr. Teter.

Agr. Eng. 432. Rural Electrification. **0-3-0**

Prerequisite: Agr. Eng. 322.

Problems involved in the distribution, uses, and costs of electricity on the farm. Mr. Weaver.

Agr. Eng. 433. Teaching Farm-Shop Work. **0-0-3**

Prerequisites: Agr. Eng. 331 and 332.

The use and care of power tools; shop management and methods of presenting the subject matter. Messrs. Howell, Coggins.

Agr. Eng. 481, 482, 483. Special Problems in Agricultural Engineering. **3-3-3**

Prerequisites: Agr. Eng. Three credits in 300 courses.

For students who desire advanced work in one of the following subjects: Farm Engines, Tractors, Farm Mach., Buildings, Conveniences, Rural Electrification, Erosion Control and Drainage. Staff.

Agr. Eng. 491, 492, 493. Senior Seminar. **1-1-1**

Prerequisite: Senior standing in Agr. Eng.

Students will be assigned special problems the results of which are to be presented to the class. Staff.

Courses for Graduates Only

Agr. Eng. 503. Advanced Drainage, Irrigation and Erosion Control. 0-0-5

Prerequisites: Grad. standing in Agr. Eng., Land Improvement Option.

An advanced study of the more complex problems in Drainage, Irrigation and Erosion Control methods. **Staff.**

Agr. Eng. 513. Advanced Farm Structures. 0-5-0

Prerequisites: Grad. standing in Agr. Eng., Rural Structures Option.

A more advanced study of the problems of Farm Structures than is given in courses Agr. Eng. 322 and Agr. Eng. 423. **Mr. Teter.**

Agr. Eng. 521, 522, 523. Research in Agr. Eng. 5-5-5

Prerequisites: Grad. standing in Agr. Eng., Any Option.

Research in specialized phases of Agr. Eng. **By arrangement, Staff.**

Agr. Eng. 531, 532, 533. Seminar. 1-1-1

Prerequisites: Grad. standing in Agr. Eng., Any Option.

Scientific Articles, Progress Reports in Research, and special problems of interest to Agricultural Engineers will be assigned, reviewed and discussed by students and members of the Agr. Eng. Staff.

ANIMAL INDUSTRY

Courses for Undergraduates

A.I. 101. Introduction to Animal Industry. 4 or 4-0

The fundamental principles of successful livestock farming. Production and processing of livestock products. The importance of animal products in the human diet. **Staff.**

A.I. 301. Types and Market Classes of Livestock. 5-0-0

A study of the types and market grades and classes of dairy cattle, beef cattle, swine, sheep, horses and mules together with their adaptabilities and distribution. Messrs. Pierce, Haig.

A.I. 302. Judging and Selection—Dairy Cattle. 0-3-0

Breed characteristics and score-card requirements for the five major breeds of dairy cattle. Relation of form to function. Practice judging.
Messrs. Haig, Ruffner.

A.I. 303. Judging and Selection—General Livestock. **0-0-3**

Fundamental principles involved and the practice of comparative judging of the different types and breeds of meat animals and work stock.

Messrs. Pierce, Ammerman.

A.I. 304. Advanced Judging and Selection—General Livestock **3-0-0**

Prerequisite: A.I. 303.

Practice and reasons in comparative judging of beef cattle, sheep, swine, horses, and mules. Only for students who have shown proficiency in general livestock judging. Extra curricular time will be required of students interested in training for judging teams. Mr. Pierce.

A.I. 306. Advanced Judging and Selection—Dairy Cattle. **0-0-3**

Prerequisite: A.I. 302.

Special emphasis on show-ring requirements for dairy cattle; advanced judging practice with oral reasons. Judging trips to various leading dairy farms will be made. Such dairy cattle judging teams as may be chosen to represent the College will be selected from among those taking this course.

Mr. Haig.

A.I. 312. Animal Nutrition I. **0-3-0**

Prerequisites: Chem. 203 (or equivalent) and Zool. 201.

Metabolism of carbohydrates, lipids, proteins, inorganic elements, and vitamins. Messrs. Peterson, Weybrew.

A.I. 323. Meat and Meat products. **0-5 or 5**

A study of live animal and carcass relationships, dressing percentages, and cut-out values. Slaughtering, cutting, curing, freezing, and handling of meats and meat products for commercial and home use.

Messrs. Brady, Blumer.

A.I. 324. Meat Selection. **2-0-0**

Prerequisite: A.I. 323.

A detailed consideration of the factors involved in the selection of carcasses and wholesale cuts of beef, pork and lamb. A thorough study of the identification of retail cuts and their adaptabilities for utilization.

Messrs. Brady, Blumer.

A.I. 331. Livestock Production. **0-0-5**

For students in agricultural education.

A study of the problems encountered in dairy and general livestock production in North Carolina and adjacent areas. Attention to the various classes of livestock will be in proportion to their importance in the agriculture of the area. Messrs. Ruffner, Hostetler.

A.I. 341-342-343. Livestock Production I, II, and III. 4-4-4

Principles and practices of general livestock management. Development of farm herds and flocks. Practical applications in feeding, breeding, and herd management on livestock farms. Subject matter sub-divided on the following basis:

I—Swine and Workstock, II—Beef cattle and sheep, III—Dairy cattle.

Messrs. Foster, Haig, Ruffner, Stewart.

A.I. 362. Diseases of Farm Animals. **0-4-0**

Prerequisites: Botany 312 and Zool. 201.

Etiology and symptoms of infectious, non-infectious, and parasitic diseases of farm animals. Methods of spread of common infectious diseases with especial emphasis upon economic losses and methods of prevention, control, and eradication of the major diseases of farm animals.

Mr. Grinnells.

Courses for Advanced Undergraduates and Graduates

A.I. 402. Animal Breeding. 0-5-0

Prerequisite: Zool. 411.

Physiology of reproduction and the mode of inheritance of important characteristics in farm animals. Origin, history, and adaptability of the breeds of livestock. Special emphasis on the place of selection, artificial insemination, inbreeding, and crossbreeding in an over-all program of animal improvement. Mr. Stewart.

A.I. 413. Animal Nutrition II. **0-0-4**

Prerequisite: A.I. 312.

The determination of digestibility; nutritional balances; measures of total nutritive energy; the fasting catabolism; growth; reproduction; lactation; work production; feeding standards; calculation of rations.

Messrs. Weybrew, Peterson.

A.I. 421, 422, 423. Animal Industry Seminar. **1-1-1**

Review and discussion of special topics and the current literature pertaining to all phases of Animal Production. **Staff.**

A.I. 433. Reproduction and Lactation **0-0-4**

Prerequisites: Zool. 201 and A.I. 402.

Physiological processes involved in reproduction and milk secretion and factors affecting them. Laboratory exercises including practice in artificial insemination of farm animals. **Mr. Elliot.**

A.I. 461 (See Chem. 461). Chemistry of Proteins. **3-0-0**

Prerequisites: Chem. 203 or 421, 422, 423.

Composition, distribution, structure, properties, amino acids, biological value. Mr. Peterson.

Courses For Graduates Only

A.I. 501, 502, 503. Topical Problems in Animal Industry. **3-3-3**

Staff.

A.I. 511. Advanced Nutrition. 3-0-0

Prerequisite: A.I. 413.

The role of minerals in the nutrition of animals. Mr. Matrone.

A.I. 521. (See Chem. 521).—Biological Assay of Vitamins. 0-0-3

Prerequisites: A.I. 413 or Chem. 462 and 482; Stat. 413.

Assay for vitamins by means of small animal and micro-biological techniques. Methods for the control or elimination of sources of error are emphasized. Techniques employed in feeding experiments with the white rat are considered. Mr. Sherwood.

A.I. 526. Modern Research in Animal Breeding. 0-0-3

Prerequisite: A.I. 402.

Review and appraisal of contemporary research in animal breeding. Mr. Stewart.

A.I. 531, 532, 533. **Research in Animal Industry.** **1-5, 1-5, 1-5**

Staff.

A.I. 561, 562, 563 (See Chem. 561, 562, 563). Research in Nutrition. 1-5, 1-5, 1-5

Nutrition Staff.

ARCHITECTURE AND ARCHITECTURAL ENGINEERING

Courses for Undergraduates

Arch. 100abc. Pencil Sketching. 3 or 3 or 3 or 1-1-1

Required of seniors in L. A., and sophomores in Ind. Arts. Elective for Engineering and Textile students.

Quick sketching of objects as seen and imagined in perspective; elementary principles of perspective, especially as applied to the visualization of imagined objects. Messrs. Paulson, Bye.

Arch. 101, 102, 103. Freehand Drawing 1, 2, and 3. 2-2-2

1. Required of juniors in Arch., and Arch. Eng.

Water color rendering. Nature and qualities of pigments; theory of color and of tone; presentation of decorative and of pictorial subjects in monochrome and in full color.

2. Required of juniors in Arch., Arch. Eng., and L. A.

Sketching in pencil, and pen and ink from models, casts and nature. Emphasis upon tonal value, pattern of darks, character and variety of line, and accenting. Lettering.

3. Required of juniors in Arch., Arch. Eng., and L. A.

Charcoal Drawing from architectural casts and models; emphasis upon delicacy and gradation of shade and shadow; value sketches of composition projects. Messrs. Bye, Crane, Paulson.

Arch. 104s. Art Appreciation for Teachers. 0-0-3

Picture study of the list suggested by the State Board of Education for grade-school use, including paintings, architecture, and sculpture.

Mr. Paulson.

Arch. 105. Art Principles in Industry. 3-0-0

Elective for Engineering and Textile students, required of sophomores in Industrial Arts.

Line, form, color, and aesthetic principles of practical art applicable to the design of articles for manufacture. Mr. Paulson.

Arch. 106. Decorative Drawing. **3 or 3 or 3**

Required of juniors in the Textile School.

Freehand drawing and creative designing of decorative motives adaptable to weaving and cloth printing. Messrs. Crane, Paulson.

Arch. 107ab. Architectural Drawing. **3-3-0**

Required of freshmen in Architecture. M. E. 105 and 106 may be substituted for Arch. 107.

[Drafting Practice.] Use of instruments in drawing plans, elevations, sections; projections; architectural lettering and conventions; tracing and blueprinting; elements of architecture and introduction to design.
Messrs. McKimmon, Holloway.

Arch. 111, 112, 113. Appreciation of Fine Arts, Architecture, Painting, Sculpture. **3-3-3**

Elective for students of junior standing.

Principles of art. Study of those qualities which constitute great art. First term, architecture; second term, painting; third term, sculpture and the minor arts. Mr. A. E. Bye.

Arch. 114abc. Clay Modeling. **1-1-1**

Prerequisite: Arch. 100.

Required of seniors in Arch.

Modeling of ornament, reliefs, and full round projects in clay or wax; moulds and plaster casting; small scale building detail models. Lectures, laboratory, and critiques. Mr. Crane.

Courses for Advanced Undergraduates

Arch. 201, 202, 203. Elements of Architecture I, II, and III. **3-3-3**

Prerequisites: M. E. 101, 2, 3, or Arch. 107ab.

Required of sophomores in Arch., Arch. Eng., and L. A.

Exercises and studies of architectural elements and details, walls, openings, etc. The orders of architecture and their application to simple problems in composition and design.
Messrs. Holloway, Correll, McKimmon, Grady.

Arch. 205. Shades and Shadows. **2-0-0**

Prerequisite: M. E. 107.

Required of sophomores in Arch., Arch. Eng., and juniors in L. A.

The determination of conventional shades and shadows as they occur on rendered drawings. Messrs. Correll, Grady.

Arch. 206. Perspective Drawing. 1-0-0

Prerequisite: M. E. 107.

Required of sophomores in Arch., Arch. Eng., and of juniors in L. A. and Agr. Engr.

Theory of perspective with special applications to illustration and design. Lectures and drawing.

Messrs. Baumgarten, Longstreet, Holloway, Pugh.

Arch. 207. Historic Motives in Textiles. 0-3-0

Elective for students of junior standing.

Chronologic development of ornament motives; the adaptation of historic motives to modern textile design.

Mr. Paulson.

Arch. 211, 212, 213. Freehand Drawing 4, 5, and 6. 3-3-3

Prerequisite: Arch. 103.

Required of fifth year Arch., elective for others.

The purpose of this course is to give the student a mastery of presentation in his own chosen medium. The first term (Arch. 211) will be devoted principally to still life; the second (Arch. 212) to landscape; the third (Arch. 213) to figure drawing. Personal technique encouraged; sound principles of drawing insisted upon. Messrs. Crane, Paulson.

Arch. 301, 302, 303. Intermediate Design, B-1, B-2, B-3. 3-3-3

Prerequisites: Arch. 201, 202, 203.

Required of juniors in Arch., and Arch. Eng.

Problems in elementary composition, design, planning and rendering. Library research. Registration with the Beaux Arts Institute of Design may be required. Messrs. Longstreet, Pugh, McKimmon, Holloway, Grady.

Arch. 304. Photographic Practice. **0-0-1**

Required of juniors in Arch., and Arch. Eng.

The practical use of photography as an aid in architectural rendition.

Mr. Paulson.

Arch. 305. Working Drawings. **0-0-2**

Prerequisites: Arch. 201, 202, 203.

Required of sophomores in Arch.

The preparation of working drawings of sections and details of construction. Messrs. Shumaker, Grady.

Arch. 321, 322, 323. History of Architecture 1, 2, and 3. **3-3-3**

Prerequisite: Arch. 203.

Required of juniors in Arch., Arch. Eng., and L. A.

The origin and development of historic styles of architecture from antiquity to the nineteenth century. Illustrated lectures, library references, sketches. Mr. Baumgarten.

Arch. 325. History of Sculpture and Mural Decoration. **0-0-2**

Prerequisite: Arch. 203.

Required of juniors in Arch.

The development of sculptural and mural art as adjuncts to architecture, ancient to modern; critique of modern decoration supplementary to architecture. Mimeographed notes, library reference and illustrated lectures.

Mr. Grady.

Arch. 351, 352. Architectural Design E-1, E-2. **3-3-0**

Prerequisite: Arch. 303.

Required of seniors in Arch. Eng.

Advanced Architectural Design studied especially from the viewpoint of structure; projects developed with wall and spanning sections; rendered presentation of practical constructive programs.

Messrs. Pugh, Longstreet, McKimmon, Grady.

Arch. 353, 354, 355. Architectural Design B-4, B-5, and B-6. **6-6-6**

Prerequisite: Arch. 303.

Required of seniors in Arch.

Advanced programs in architectural design. Registration with the Beaux Arts Institute of Design may be required. Complete presentation drawings of *projects* such as Class B-

Messrs. Pugh, Longstreet, McKimmon, Grady.

Arch. 401, 402, 403. Architectural Design A-I, A-II, A-III. **6-6-6**

Prerequisite: Arch. 355.

Required of fifth year in Arch.

Major problems in advanced planning and research. Registration with the Beaux Arts Institute of Design may be required.

Messrs. Shumaker, Pugh, Grady.

Arch. 407. Architectural Composition. **2-0-0**

Prerequisite: Arch. 323.

Required of fifth year in Arch.

Principles of planning and composition as related to buildings; architectural motives, group planning; library research and sketches.

Mr. Shumaker.

Arch. 408. Architectural Estimates. **0-0-2**

Prerequisite: Arch. 303.

Required of fifth year in Arch. and seniors in Arch. Engr.

Lectures and problems in taking off quantities and in estimating materials and labor cost in building construction.

Mr. Shumaker.

Arch. 409. Building Materials I. **3-0-0**

Prerequisite: Arch. 303.

Required of seniors in Arch. and Arch. Eng.

Nature and qualities of building materials, especially fabricated materials, and their use in interior and exterior finish and in construction. Sample exhibits, lectures and demonstrations.

Mr. Grady.

Arch. 411, 412. Architectural Office Practice. **0-3-3**

Prerequisite: Arch. 301.

Required of juniors in Arch., seniors in Arch. Eng.

The preparation of working drawings from sketches, following office routine. Messrs. Pugh, Longstreet.

Arch. 414. Professional Practice. **0-0-1**

Prerequisite: Arch. 303.

Required of fifth year in Arch.

Ethics and procedure in the profession of architecture. Relation of patron and commissionee. Mr. Shumaker.

Arch. 415. City Planning. **0-2-0**

Prerequisite: Arch. 323.

Required in fifth year in Arch.

Origin and development of urban communities; aesthetic, economic, and circulatory problems in city and town planning; zoning and restraining legislation. Messrs. Shumaker, Baumgarten.

Arch. 416. Architectural Specifications. **0-0-3**

Prerequisite: Arch. 303.

Required of seniors in Arch. and Arch. Eng.

Execution of specifications for architectural building contracts; identification of material, clarification of terms; protection of patron, contractor, and architect. Mr. Shumaker.

Arch. 421. History of Architecture 4. **0-3-0**

Prerequisite: Arch. 323.

Required in fourth year in Arch.

Nineteenth century and contemporary architectural styles, with special attention to trends resulting from the use of modern materials; illustrated lectures, discussion assignments, and reports.

Messrs. Baumgarten, Grady.

Arch. 501, 502, 503. Graduate Design I, II, III. **4-4-4**

Prerequisites: Arch. 323, 403 (or 352).

Class A.—Project. Advanced problems in design. Archaeology. Measured Drawings. Registration with the Beaux Arts Institute of Design is required.

Messrs. Shumaker, Pugh, Grady.

Arch. 511, 512, 513. Historic Research I, II, III. **4-4-4**

Prerequisites: Arch. 323, 403 (or 352).

Research in Architecture and Art in some important phase of its development. Library work with sketches.

Messrs. Paulson, Baumgarten, Grady, Pugh.

BOTANY

Courses for Undergraduates

Bot. 101, 102. General Botany. **4-4-0 or 0-4-4**

Forestry students will follow a 4-4-0 sequence.

The first term: The structure and physiology of the higher plants; the second: a survey of the major lower plant groups with the emphasis upon the economic forms, bacteria and fungi. Staff.

Bot. 203. Systematic Botany. **0-0-3**

Prerequisites: Bot. 101, 102.

An introduction to the local flora and the classification of the plants included therein. Staff.

Bot. 211-213. Dendrology. **3-0-3**

Prerequisites: Bot. 101, 102, 203.

The principal trees of North America. Mr. Fox.

Courses for Advanced Undergraduates

Bot. 312. General Bacteriology. **0-4 or 4**

Prerequisites: Bot. 101, 102, or Zool. 101.

An introduction to the principles of bacteriology; laboratory work on modern cultural methods of handling and studying bacteria. Mr. Shunk.

Bot. 315. Plant Diseases. 0-4-0 or 0-0-4

Prerequisite: Bot. 321.

The nature, causes and control of plant diseases. Staff.

Bot. 321. Plant Physiology. **5-0 or 5**

Prerequisites: Bot. 101, 102, and Chem. 203

The activities of living plants with special emphasis upon the fundamental principles concerned. Messrs. Anderson, Scofield.

Botany 331. Plant Microtechnique. 3-0-0

Prerequisites: Bot. 101, 102, and Chem. 203.

Methods of preparation of plant structures for microscopic examination. Mr. Ball.

Courses for Advanced Undergraduates and Graduates

Bot. 402. Crop Geography. 0-3-0

History, distribution and ecology of cultivated plants. Mr. Wells.

Botany 411. Morphology of Non-Vascular Plants. 0-0-3

Prerequisites: Bot. 101, 102, 203.

Comparative morphology, ontogeny and evolution of the major groups of non-vascular plants. **Mr. Ball.**

Botany 412. Morphology of Vascular Plants. 0-3-0

Prerequisites: Bot. 101, 102, 203.

Comparative morphology, ontogeny and evolution of the major groups of vascular plants. Mr. Ball.

Botany 413. Plant Anatomy. 0-0-3

Prerequisites: Bot. 101, 102, 203, 412.

Anatomy of Gymnosperms and of Angiosperms is emphasized. Comparative growth and structure of meristems. Development and mature structure of cell types, tissues, stem, root, and leaf. Mr. Ball.

Bot. 415. Diseases of Field Crops. 3-0-0

Prerequisite: Bot. 315.

The most important diseases of field crops. Mr. Lehman.

Bot. 416. Diseases of Fruit Crops. 0-3-0

Prerequisite: Bot. 315.

The more important diseases of fruit crops. Mr. Clayton.

Bot. 417. Diseases of Vegetable Crops. 0-3-0

Prerequisite: Bot. 315.

The more important diseases of vegetable crops. Mr. Ellis.

Bot. 418. Diseases of Forest Trees 3-0-0

Prerequisite: Bot. 315.

The more important diseases affecting trees. Mr. Campana.

Bot. 421. Systematic Botany of Grasses. 3-0-0

Prerequisite: Bot. 203.

Identification and classification of important species. Mr. Wells.

Bot. 423. Systematic Botany of Economic Dicot Families. 0-0-3

Prerequisite: Bot. 203.

Identification, classification and economic significance of such important families as Leguminosae, Rosaceae, and Solanaceae. Mr. Fox.

Bot. 432, 433. Advanced Plant Physiology. 0-3-3

Prerequisites: Bot. 101, 102, 321.

A critical and comprehensive treatment of the various aspects of plant physiology; particular attention given to basic principles and to recent developments. Mr. Anderson.

Bot. 441. Plant Ecology. 3-0-0

Prerequisites: Bot. 101, 102, 321.

Environmental control of plant distribution with emphasis upon the habitats and vegetation of North Carolina. Mr. Wells.

Bot. 442. Microanalysis of Plant Tissue. 3-0-0

Prerequisites: Bot. 101, 102, 321.

The identification in plant tissues of mineral elements and organic compounds and the physiological significance of these materials. Mr. Anderson.

Bot. 443. Soil Microbiology. 0-0-3

Prerequisites: Bot. 101, 102, 321, 312.

The more important microbiological processes that occur in soils: decomposition of organic materials, ammonification, nitrification, and nitrogen fixation. Mr. Shunk.

Bot. 452. Advanced Bacteriology. 0-3-0

Prerequisites: Bot. 101, 102, 312.

Methods used in the bacteriological analysis of water and milk.
Mr. Shunk.

Bot. 453. Advanced Plant Ecology. 0-0-3

Prerequisites: Bot. 321, 441.

Practice in the use of the instruments necessary in the study of environmental factors; advanced readings and conferences on plant distribution in relation to these factors. Mr. Wells.

Bot. 462. Research Methods in Plant Physiology. 0-3-0

Experience in the use of techniques important in physiological research.

Mr. Scofield.

Bot. 473. Aquatic Biology. 0-0-3

Prerequisites: Bot. 101, 102.

Identification and control of the aquatic algae and protozoa which give trouble in reservoirs. A survey of the higher water and marsh plants is also included. Mr. Whitford.

Courses for Graduate Students

Bot. 505. Phytopathology. 5-0-0

Prerequisites: Bot. 315 and permission of instructor.

Advanced studies on epiphytology and etiology of plant diseases

Staff.

Bot. 506. Research Methods in Plant Pathology. 0-5-0

Prerequisite: Bot. 505.

Survey and practice of methods used in phytopathological research.

Mr. Jensen.

Bot. 511, 512, 513. Bacteriology: Special Studies. 3-3-3

Prerequisites: Bot. 312, 452.

Special work on restricted groups of bacteria, such as nitrogen bacteria of the soil, milk organisms, and special groups of bacteria in water.

Mr. Shunk.

Bot. 515, 516, 517. Plant Pathology Research. 3-3-3

Prerequisite: Permission of instructor.

Staff.

Bot. 525, 526. Plant Pathology Seminar. 0-1-1

Prerequisite: Permission of instructor.

Discussion of phytopathological topics. Staff.

Bot. 521. Advanced Systematic Botany. 3-0-0 or 0-0-3

Prerequisites: Bot. 203.

An advanced survey of restricted groups of plants involving organization and distribution problems. Messrs. Wells, Fox.

Bot. 522, 523. Cytogenetics. See F. C. 522, 523.

Bot. 531, 532, 533. Plant Physiology. 3-3-3

Prerequisites: Bot. 321, 432.

Critical study of some particular problem, involving original investigation together with a survey of pertinent literature.

Messrs. Anderson, Scofield.

Bot. 541. Plant Ecology. 3-0-0 or 0-0-3

Prerequisites: Bot. 203, 441.

Minor investigations in vegetation-habitat problems accompanied by advanced reference reading. Mr. Wells.

Bot. 551, 552, 553. Research in Botany. 3-3-3

Prerequisite: 30 hours in 100-300 courses in Botany. Staff.

Bot. 561, 562, 563. Seminar. 1-1-1

Attendance by the student upon the weekly seminar together with the presentation of a paper in his major field of research. Mr. Wells.

CERAMIC ENGINEERING

Courses for Undergraduates

Cer. E. 202. Ceramic Materials. 0-3-0

Prerequisite: Geol. 120.

Required of sophomores in Ceramic Engineering.

The origin and occurrence of ceramic raw materials, their chemical and physical properties and system of measuring these. Mr. Kriegel.

Cer. E. 205. Nonmetals Mining and Beneficiation 0-0-3

Prerequisite: Geol. 120.

Required of sophomores in Cer. E.

The winning beneficiation and preparation of ceramic materials; the equipment and processes used. Mr. Kriegel.

Courses for Advanced Undergraduates

Cer. E. 301. Drying Fundamentals and Practice. 3-0-0

Prerequisites: Phy. 203, Cer. E. 202.

Required of juniors in Cer. E.

Theory and practice of drying ceramic products; problems.

Mr. Hackler.

Cer. E. 302. Firing Fundamentals and Practice. 0-3-0

Prerequisite: Cer. E. 301.
Required of juniors in Cer. E.
The theory and practice of firing ceramic products. Problems.
Mr. Hackler.

Cer. E. 303. Ceramic Calculations. 0-0-3

Prerequisites: Chem. 212, Cer. E. 302.
Required of juniors in Cer. E.
Solution of chemical and physical problems of the ceramic industries.
Mr. Rue.

Cer. E. 308, 309. Ceramic Processes. 0-2-2

Prerequisite: Cer. E. 301.
Required of juniors in Cer. E.
Physical, chemical, and artistic requirement of ceramic products. The equipment and processes used in the manufacture of ceramic products. Laboratory practice. Messrs. Kriegel, Hackler.

Courses for Graduates and Advanced Undergraduates

Cer. E. 401. Pyrometry. 1-0-0

Prerequisite: Cer. E. 302.
Required of seniors in Cer. E.
The theory and use of temperature measuring instruments in industry.
Mr. Rue.

Cer. E. 403. Silicates I. 3-0-0

Prerequisites: Chem. 331 and Cer. E. 303.
Required of seniors in Cer. E.
The fundamental principles underlying the composition and production of whitewares, terra cotta, cements and plasters. Mr. Rue.

Cer. E. 404 Silicates II. 0-3-0

Prerequisites: Chem. 331 and Cer. E. 303.
Required of seniors in Cer. E.
The fundamental principles underlying the composition and production of glazes, glasses and porcelain enamels. Mr. Rue.

Cer. E. 405.—Silicates III. 0-0-3

Prerequisites: Chem. 331 and Cer.E. 303.
Required of seniors in Cer. E.
The fundamental principles underlying the composition, production and uses of refractories and abrasives. Mr. Kriegel.

Cer. E. 411, 412, 413. Ceramic Laboratory. 3-3-3

Prerequisites: Cer. E. 303, 309, Corequisite: Cer. E. 403, 404.

Required of seniors in Cer. E.

Advanced practice in producing and determining the chemical and physical properties of ceramic materials and products; thesis.

Staff.

Cer. E. 414, 415. Ceramic Designing. 0-3-3

Prerequisites: E.M. 321, Cer. E. 205 and 302.

Required of seniors in Cer. E.

Designing of ceramic equipment and structures.

Messrs. Kriegel, Rue.

Cer. E. 421, 422, 423. Seminar. 1-1-1

Prerequisite: Any term may be taken with permission of instructor.

Elective for seniors in ceramic engineering.

Literature survey of selected topics in ceramic engineering.

Staff.

Cer. E. 430. Ceramic Materials and Processes. 3 or 3-0

Prerequisite: Geol. 315.

Required of senior in Engineering-General curriculum.

Properties and uses of ceramic raw materials. Preparation of materials, forming, drying, and firing processes in ceramic manufacture.

Special course, not offered after July 1949. Staff.

Cer. E. 431. Ceramic Products. 0-3 or 3

Prerequisite: Cer. E. 430.

Required of seniors in Engineering-General curriculum.

Properties, characteristics and industrial application of ceramic products. Structural clay products, refractories, glass, electrical porcelains, thermal insulators, vitreous enamels, and chemical wares are discussed.

Special course, not offered afer July 1949. Staff.

Courses for Graduates Only

Cer. E. 501, 502, 503. Advanced Ceramic Designing. 3-3-3

Prerequisite: Cer. E. 415 or equivalent.

Advanced study and designing of ceramic machinery, dryers, kilns and plant structures. Mr. Kriegel.

Cer. E. 513, 514, 515.—Ceramic Research. **3-3-3**

Prerequisite: Graduate standing.

An original and independent investigation in some phase of ceramics will be assigned to meet the desire of the student for specialization. The report is required as a graduate thesis. Staff.

Cer. E. 517, 518, 519.—Industrial Adaptability of Ceramic Materials. 3-3-3

Prerequisite: Cer. E. 413 or equivalent.

Investigation to determine the industrial uses to which various ceramic minerals can be put. A written report covering this investigation is required. If the student does not enroll in Ceramic Research the report will be prepared in accordance with the requiremnts of a graduate thesis.

Staff.

Cer. E. 521, 522, 523. **Silicates IV, V, VI.** 3-3-3

Prerequisites: Cer. E. 403, 404, 405 or equivalent.

Advance studies in the field of ceramics in which a student wishes to specialize. Staff.

Cer. E. 531, 532, 533. **Ceramic Seminar.** **1-1-1**

Prerequisite: Graduate standing.

Literature investigations and reports of special topics in ceramic engineering and allied fields. Staff.

CHEMICAL ENGINEERING

Courses for Undergraduates

Ch. E. 205. Chemical Process Principles I. **0-0-3**

Required of sophomores in chemical engineering.

Prerequisites: Math 201; Phys. 201; Chem. 211.

An introduction to methods of calculation involving material balances, stoichiometry, the gas laws, vapor pressures, humidity and saturation.

Staff.

Ch. E. 301. Elements of Chemical Engineering I. **3 or 3-0**

Prerequisites: Chem. 103, Phys. 203, Math. 203.

An introduction to principles of chemical engineering including basic calculations involved in industrial processes and equipment. The course is designed for students not majoring in chemical engineering. Staff.

Special course will not be offered after June 1949.

Ch. E. 302. Elements of Chemical Engineering II. 0-3 or 3

Prerequisite: Ch. E. 301.

Underlying theory of the unit operations, such as fluid flow, heat transfer, drying, distillation, filtration, adapted for students not majoring in chemical engineering. **Staff.**

Special course will not be offered after June 1949.

Courses for Advanced Undergraduates

Ch. E. 311. Chemical Process Principles II. 3-0-0

Prerequisites: Math. 202, Phys. 202, Ch. E. 205.

Required of juniors in chemical engineering.

The calculation of heat and weight balances involved in industrial processes. Applications of physical chemistry, thermophysics, thermochemistry, solubility and sorption by the problem method. Staff.

Ch. E. 312. Chemical Process Principles III. 0-3-0

Prerequisite: Ch. E. 311.

Required of juniors in chemical engineering.

A continuation of Ch. E. 311 with more comprehensive problems in fuels and combustion, chemical, metallurgical and petroleum processes. Laboratory work includes technical analysis by standard methods of testing industrial products. Two hours recitation, one laboratory period per week. Staff.

Ch. E. 313. Unit Operations I. 0-0-3

Prerequisite: Ch. E. 312.

Required of juniors in chemical engineering.

Fundamental principles of fluid flow, heat transfer and evaporation with emphasis on design calculations. Messrs. Schoenborn, Pike.

Ch. E. 315. Chemical Engineering Thermodynamics I. 0-0-3

Prerequisites: Chem. 431; Ch. E. 312.

Required of juniors in chemical engineering.

A study of the laws of thermodynamics and their application to chemical engineering problems. Emphasis on the theory, data and approximation methods as applied to physical and chemical systems. Mr. Beatty.

Courses for Graduates and Advanced Undergraduates

Ch. E. 411, 412. Unit Operations II and III. 3-3-0

Prerequisite: Ch. E. 313.

Required of seniors in chemical engineering.

A continuation of Ch. E. 313. Theory and methods of calculation involved in distillation, absorption, drying, size separation, filtration, etc.

Messrs. Schoenborn, Pike.

Ch. E. 415. Chemical Engineering Thermodynamics II. 3-0-0

Prerequisite: Ch. E. 315.

Required of seniors in chemical engineering.

A continuation of Ch. E. 315. Thermodynamic properties, chemical reaction equilibria, vaporization and condensation equilibria, etc.

Mr. Beatty.

Ch. E. 427. Process Engineering. 0-0-2

Prerequisite: Ch. E. 412.

Required of seniors in chemical engineering.

A study of selected chemical processes with emphasis on the engineering, chemical and economic factors involved. Staff.

Ch. E. 431, 432, 433. Unit Operations Laboratory I, II, III. 3-3-3

Prerequisite: Ch. E. 313; concurrent, corresponding lecture course.

Required of seniors in chemical engineering.

Laboratory work on typical apparatus involving the unit operations. Experiments are designed to augment the theory and data of the lecture courses and to develop proficiency in the writing of technical reports.

Staff.

Ch. E. 440. Electrochemical Engineering. 3 or 3 or 3

Prerequisite: Physical Chemistry.

Elective for seniors in chemical engineering.

The application of electrochemical principles to such topics as electrolysis, electronanalysis, electroplating, metal refining, etc.

Ch. E. 441. Cellulose Industries. 3 or 3 or 3

Prerequisite: Chem. 422.

Methods of manufacture and application of cellulose chemical conversion products. Emphasis placed on recent developments in the fields of synthetic fibers, films, lacquers, and other cellulose compounds.

Mr.Seely.

Ch. E. 442. Technology of Pulp and Paper. 3 or 3 or 3

Prerequisite: Chem. 422.

Elective for seniors in chemical engineering.

Fundamentals of pulp and paper manufacture with emphasis on recent advances in the field. Mr. Seely.

Ch. E. 443. Technology of Plastics. 3 or 3 or 3

Prerequisite: Chem. 422.

Elective for seniors in chemical engineering.

The properties, methods of manufacture, and applications of synthetic resins. Recent developments in the field are stressed. Mr. Seely.

Ch. E. 444. Fuels and Combustion. **3 or 3 or 3**

Prerequisite: Ch. E. 312.

Solid, liquid and gaseous fuels; fundamentals of combustion with application to design and use of industrial equipment. Mr. Bright.

Ch. E. 445. Petroleum Refinery Engineering. 3 or 3 or 3

Prerequisite: Ch. E. 412.

An introduction to the petroleum industry including (1) Nature of petroleum and its fractions, octane numbers, viscosity relationships, etc. (2) Operations of thermal and catalytic cracking, stabilization, alkylation, isomerization, crude fractionation, etc. (3) Problem work covering high pressure phase relationships, and related material. Mr. Pike.

Ch. E. 446. Chemical Reaction Rates. 3 or 3 or 3

Prerequisites: Ch. E. 415 and Chem. 432.

A basic study of the rates of homogeneous reactions, heterogeneous reactions, and catalysis. Staff.

Ch. E. 461, 462, 463. Seminar. 1-1-1

Prerequisite: Any terms may be taken with permission of instructor.

Elective for seniors in chemical engineering.

Literature survey of selected topics in chemical engineering. Emphasis on oral and written presentation. Staff.

Ch. E. 471, 472, 473. Chemical Engineering Projects. 3-3-3

Prerequisite: Ch. E. 313.

Two terms required of seniors in chemical engineering.

Introduction to research through experimental, theoretical and literature studies of chemical engineering problems. Oral and written presentation of reports. Staff.

Courses for Graduates Only

Ch. E. 511. Heat Transfer I. 3-0-0

Prerequisite: Ch. E. 313.

An advanced course dealing primarily with heat transfer between liquids and solids, optimum operating conditions and design of equipment.

Mr. Beatty.

Ch. E. 512. Diffusional Operations. 0-3-0

Prerequisite: Ch. E. 411.

An advanced treatment of mass transfer particularly as applied to absorption, extraction, drying, humidification and dehumidification.

Mr. Schoenborn.

Ch. E. 513. Distillation. 0-0-3

Prerequisite: Ch. E. 411.

Vapor-liquid equilibria of non-ideal solutions, continuous distillation of binary and multicomponent systems, batch distillation, azeotropic and extractive distillation. Mr. Schoenborn.

Ch. E. 514. Drying of Solids. 0-0-3

Prerequisite: Ch. E. 411.

An advanced course on the mechanism of drying operations with application to design of equipment, such as, cabinet, tunnel, rotary, drum and spray driers. Mr. Pike.

Ch. E. 515, 516. Thermodynamics I and II. 3-3-0

Prerequisite: Ch. E. 415 or equivalent.

Advanced topics in chemical engineering thermodynamics including equilibria of physical and chemical systems, high pressure systems, generalized properties of hydrocarbons, etc. Mr. Beatty.

Ch. E. 517. Catalysis of Industrial Reactions. 3 or 3 or 3

Prerequisite: Ch. E. 446.

A study of the mechanism of catalysis with emphasis on practical application to operation and design of industrial processes. Mr. Pike.

Ch. E. 521. Heat Transfer II. 3-0-0

Prerequisite: Permission of instructor.

Conduction, heating and cooling of solids, radiant heat transmission. Mr. Beatty.

Ch. E. 531, 532, 532. Equipment and Plant Design. 3-3-3

Prerequisite: Ch. E. 411.

Design and selection of process equipment, through solution of comprehensive problems involving unit operations, kinetics, thermodynamics, strength of materials and chemistry. Mr. Hazelton.

Ch. E. 561, 562, 563. Chemical Engineering Seminar. 1-1-1

Prerequisite: Graduate standing.

Literature investigations and reports of special topics in chemical engineering and allied fields. Staff.

Ch. E. 571, 572, 573. Chemical Engineering Projects. 2-2-2

Prerequisite: Graduate standing.

An investigation on some phase of chemical engineering or allied field.

Staff.

Ch. E. 581, 582, 583. Chemical Engineering Research. 3-3-3

Prerequisite: Graduate standing.

Independent investigation of an advanced chemical engineering problem. A report of such an investigation is required as a graduate thesis.

Staff.

CHEMISTRY

Courses for Undergraduates

Chem. 101, 102. General Inorganic Chemistry. 4-4-0 or 0-4-4

Recitations and laboratory work; theories of laws, history, occurrence, preparation, properties, and uses of the more important elements and their compounds; formulae, valence, equations and calculations. Staff.

Chem. 103. Qualitative Analysis 0-0-4

Prerequisites: Chem. 102 or 202.

Identification and separation of more common ions and analysis of mixture of salts and commercial products. Messrs. Wilson, Caveness.

Chem. 103X. General Inorganic Chemistry. 4-0-0

(This course corresponds to Chem. 103 in the Catalog issued in April, 1947. Students who do not take this course in the Fall term, 1948, will take Chem. 103, Qualitative Analysis, to complete the requirement for one year of Chemistry.) Staff.

Chem. 201, 202. General Inorganic Chemistry. 5-5-0 or 0-5-5

Subject matter same as 101, 102. Staff.

Chem. 203. Introduction to Organic Chemistry. 5-0-0 or 0-0-5

Prerequisites: Chem. 201, 202.

Hydrocarbons, alcohols, aldehydes, ketones, acids, ethers, esters, amino-acids, and benzene derivates; carbohydrates, fats, proteins, and related compounds. Mr. Reid.

Chem. 211. Qualitative Analysis. 4-0-0

Prerequisites: Chem. 101, 102, 103, or 201, 202.

Identification and separation of more common ions. Analysis of mixtures of salts of commercial products.

(Students who do not take this course in the Fall term, 1948, will take Chem. 103 to complete the requirement for Qualitative Analysis.)

Messrs. Wilson, Caveness, Ingram, Oliver.

Chem. 212. Quantitative Analysis. **0-4-0**

Prerequisite: Chem. 211.

Volumetric Analysis: Alkalinity, acidimetry, oxidation, iodometric titrations. Messrs. Wilson, Caveness, Ingram, Oliver.

Chem. 213. Quantitative Analysis. **0-0-4**

Prerequisite: Chem. 211.

Required of sophomores in Chemical Engineering. A continuation of Chem. 212. Gravimetric methods. Substances of more difficult nature are analyzed, as minerals, steel, alloys, limestone, Paris green, etc.

Messrs. Wilson, Caveness, Ingram, Oliver.

Chem. 215, 216. Quantitative Analysis. **3-3-0**

Prerequisite: Chem. 103.

Required of sophomores in Chemical Engineering. Lectures identical with those for Chem. 211 and 212, with less time for laboratory exercises.

Messrs. Wilson, Caveness, Ingram, Oliver.

Chem. 331. Physical Chemistry. **5-0-0**

Prerequisites: Chem. 101, 102, 103.

Fundamental chemical principles from a physiochemical viewpoint; special attention to silicate analysis, colloids, and phase rule. Mr. Sutton.

Courses for Graduates and Advanced Undergraduates

Chem. 401. Historical Chemistry. **2-0-0**

Prerequisites: Chem. 101, 102, 103.

Development of Chemistry and the history of men instrumental in the progress of Chemistry. Staff.

Chem. 402, 403. Theoretical Chemistry. **0-2-2**

Prerequisites: Chem. 101, 102, 103.

Atoms and molecules; chemical reactions and conditions influencing them; electronic conception of valence, radio activity. Mr. Jordan.

Chem. 411. Advanced Qualitative Analysis. **4-0-0**

Prerequisite: Chem. 211 or its equivalent.

Lectures and laboratory work dealing with the analysis of alloys and complex mixture. Mr. Wilson.

Chem. 412. Advanced Quantitative Methods. 0-3 or 3

Prerequisite: Chem. 213 or its equivalent.

Methods and apparatus in advanced quantitative analysis; heat of combustion, colorimetry, complete analysis of ores, special steels, paint pigments and alloys. Mr. Wilson.

Chem. 421, 422, 423. Organic Chemistry. 5-5-5

Prerequisites: Chem. 102 or 202.

Aliphatic and aromatic compounds; practical applications; methods of preparation and purification of compounds, and their structures.

Mr. Reid.

Chem. 424. The Chemistry of Hydrocarbons and Their Derivatives. 3-0-0

Prerequisites: Chem. 421, 422, 423.

New developments in solvents, resins, detergents, synthetic rubber, motor fuels. Mr. Reid.

Chem. 425, 426, 427. Organic Chemistry. 4-4-4

Prerequisites: Chem. 102 or 202.

Required of Chemical Engineers.

Identical with Chem. 421, 422, 423 except with less time for laboratory exercises. Mr. Reid.

Chem. 431, 432, 433. Physical Chemistry. 4-4-4 or 4-4-0

Prerequisite: Chem. 213.

Principles of Physical Chemistry; laws and theories, application to various branches of chemistry and to industrial processes. Mr. Sutton.

Chem. 441. Food Products and Adulterants. 3-0-0

Prerequisites: Chem. 203 or 421, 422, 423.

Food principles; cereals, starches, sugars, fats; milk and milk products; the packing house; food preservation; beverages, spices and condiments; food legislation, food advertising. Mr. Satterfield.

Chem. 442. Chemistry of Colloids. 0-3-0

Prerequisites: Chem. 203 or 421, 422, 423.

Colloidal behavior, osmotic pressures, dialysis, sols and gels, membranes and membrane equilibria, proteins, and Donnan equilibrium. Mr. White.

Chem. 451, 452. Physiological Chemistry. 3-3-0

Prerequisities: Chem. 203 or 421, 422, 423.

Essential chemical facts pertaining to life processes; digestion, absorption, metabolism, secretions, and excretions; lectures, laboratory.

Mr. Satterfield.

Chem. 461 (See A.I. 461). Chemistry of Proteins. 3-0-0

Prerequisites: Chem. 203 or 421, 422, 423.

Composition, distribution, structure, properties, amino acids, biological value. Mr. Peterson.

Chem. 462. Chemistry of Vitamins. 3-0-0

Prerequisities: Chem. 203 or 421, 422, 423.

Application of vitamin hypothesis to human nutrition; history, nomenclature, properties, distribution, effects of deficiencies, vitamin values.

Mr. Satterfield.

Chem. 472. Blood Analysis. 0-3-0

Prerequisites: Chem. 212 and 421, 422, 423.

Hemoglobin, sugar, urea, uric acid, cholesterol, creatine, creatinine, nonprotein, nitrogen, amino-acid nitrogen, calcium. Folin-Wu system is emphasized; lectures and laboratory. Mr. Satterfield.

Chem. 481. Agricultural Chemistry. 0-0-3

Prerequisites: Chem. 101, 102, 103, and 203 or 421, 422, 423.

Feeding the plant; insecticides and fungicides; transforming the plant into human food and animal food; composition of plants; relation between composition and uses. Mr. Satterfield.

Chem. 482, 483. Food and Nutrition. 0-3-3

Prerequisities: Chem. 203 or 421, 422, 423.

Carbohydrates, fats, proteins, amino-acids, minerals, fiber, vitamins, enzymes; nutritive value of food materials; digestion, food idiosyncrasy; acidosis and alkalosis. Mr. Satterfield.

Chem. 491, 492, 493. Advanced Physical Chemistry. 3-3-3

Prerequisites: Chem. 431, 432, 433.

An advanced problem course designed for chemical engineers.

Mr. Sutton.

Courses for Graduates Only

Chem. 501, 502, 503. Organic Chemistry, Advanced. 3-3-3

Prerequisites: Chem. 421, 422, 423.

Principles of organic chemistry; current literature; laboratory work and preparation in quantity. Mr. Reid.

Chem. 511. Organic Qualitative Analysis. 0-3-0

Prerequisites: Chem. 421, 422, 423.

Detection of elements and radicals, group characteristics. Mr. Reid.

Chem. 512. Organic Quantitative Analysis. 0-0-3

Prerequisites: Chem. 212, 421, 422, 423.

Analysis of organic compounds for carbon, hydrogen, nitrogen, the halogens, sulfur. Mr. Reid.

Chem. 521. (See A.I. 521). Biological Assay of Vitamins. 0-0-3

Prerequisites: A.I. 413 or Chem. 462 and 482; Stat. 413.

Assay for vitamins by means of small animal and micro-biological techniques. Methods for the control or elimination of sources of error are emphasized. Techniques employed in feeding experiments with the white rat are considered. Mr. Sherwood.

Chem. 523. Micro-Chemical Analysis. 3 or 3 or 3

Prerequisite: Chem. 213.

Inorganic micro qualitative analysis; fibers, starches, etc. Mr. Wilson.

Chem. 531, 532, 533. Chemical Research. 3-3-3

Prerequisite: 54 term credits in Chemistry. Open to all graduates.

Special problems that will furnish material for a thesis. Staff.

Chem. 541, 542, 543. Seminar. 1-1-1

Required of graduate students specializing in Chemistry.

Preparation and presentation of abstracts of current publications in the field of Chemistry.

Chem. 552, 553. Biochemistry. **0-3-3**

Prerequisites: Chem. 421, 422, 423, 482, 483.

Special topics in Biochemistry. Mr. Satterfield.

Chem. 561, 562, 563 (See A.I. 561, 562, 563). Research in Nutrition. **1-5, 1-5, 1-5**

Messrs. Satterfield, Peterson, Sherwood.

CIVIL ENGINEERING

Courses for Undergraduates

C. E. 101, 102, 103. Drawing. **1-1-1**

Plain lettering, common symbols, platting of areas from compass-survey notes furnished, filling in contours from notes furnished, tracing, calculation of areas by planimeter; finished maps. Mr. Lambe.

C. E. 201.Elementary Surveying. **3-0-0**

Prerequisites: Math 102, M.E. 103.

The use, care and adjustment of surveying instruments; plane surveying, grade and construction lines. Staff.

C. E. 208, 209. Surveying and Mapping I. **0-4-4**

Prerequisites: Math 112 or Math 102; and sophomore standing.

First term: Use, care and adjustment of surveying instruments; land surveying, leveling, stadia, plane table; methods of topographic surveying.

Second term: U. S. Public Land Surveys, methods of map construction, simple curves, area and earthwork computations.

Selected field and drafting-room exercises to accompany and supplement the lecture work. Staff.

C. E. 211, 212, 213. Surveying. **4-4-3**

Prerequisites: Math. 102; M. E. 103.

Theory and practice of plane and topographical surveying; engineering surveys for construction; engineering astronomy; aerial surveying and photogrammetry; theory and practice of route surveying including simple, compound, reversed, spiral and vertical curves; earthwork computations including the mass diagram, slope stakes. Drafting room practice in the preparation of maps and plans from original field notes. Staff.

Courses for Advanced Undergraduates

C. E. s300. Surveying and Mapping II. 3 credits
Prerequisite: C. E. 209.
Offered only at Hill Forest Summer Camp.
Boundary surveys; complete topographic survey and map of a section of College Experimental Forestry Lands. Staff.

C. E. 312. Materials Testing Laboratory. 0-2-0
Co-requisite: E. M. 312.
Study of cementing materials; physical properties and methods of proportioning mortars and concretes; structural ceramic products, building stones. Staff.

C. E. 313. Materials Testing Laboratory. 0-0-2
Co-requisite: E. M. 321.
Study and investigation of physical properties and performance of timber, plywood, glued construction, timber connections, cast iron and plastics. **Staff.**

C. E. 351, 352, 353. Construction Materials & Estimates. 2-2-2
Physical properties of materials as related to their proper use in construction. Methods of making quantity surveys and cost estimates. Mr. Brown.
Special course will not be offered after June 1949.

C. E. 365. Sanitary Equipment for Buildings. 3-0-0
Prerequisite: E. M. 312.
Lectures covering private water supplies and sewage disposal facilities, water supply piping and waste and vent piping in building plumbing systems, booster pumps, water heaters, water softeners. Design problem. Mr. Funk.

C. E. 371, 372, 373. Transportation Engineering. 3-3-3
Prerequisite: C. E. 213.
Co-requisites: Engineering Mechanics and Materials Testing Laboratory.
Railway maintenance of way, turnout design, signals, motive power, and tonnage ratings; principles and practice in the location, design, construction and maintenance of highways and airports. Drafting room practice in highway and airport design; laboratory practice in soil classification, soil compaction and soil stabilization. Mr. Babcock.

Courses for Graduates and Advanced Undergraduates

C. E. 401. Materials Testing Laboratory. 2-0-0
Prerequisites: C. E. 313; E. M. 321.
Study of structural metals, riveted and welded joints, reinforced concrete; failures of materials, significance of test results, selection of working stresses. **Staff.**

C. E. 421, 422. Reinforced Concrete. 3-3-0

Co-requisite: E. M. 422.

Derivation of formulas used in reinforced concrete design, use of diagrams and curves. Illustrative problems in design.

Messrs. Mann, Bramer, Griset.

C. E. 423, 424, 425. Graphic Statics. 1-1-1

Prerequisite: E. M. 313.

Principles involved in the solution of problems by graphical methods; moments, shears; resultant pressure on retaining wall; stress diagrams.

Mr. Mann.

C. E. 426, 427. Structural Design. 0-3-3

Prerequisites: E. M. 422; C. E. 431a.

Design of beams, columns, tension members, plate girders, trusses and structures. Messrs. Mann, Griset.

C. E. 428, 429. Structural Design. 0-5-5

Prerequisites: C. E. 401, C. E. 437.

Structural design of members and connections in timber, aluminum, and steel structures; preparation of structural drawings. Design of reinforced concrete beams, columns, foundations, and retaining walls; deflection and torsional problems in reinforced concrete; effects of shrinkage and plastic flow; prestressed concrete design. Messrs. Bramer, Griset.

C. E. 431a, 432a. Theory of Structures. 3-3-0

Co-requisite: E. M. 422.

Building loads; stress analyses of wooden and steel roof trusses; wood, steel and reinforced concrete floor systems; portals and bents; wind stresses in tall buildings; brief study of bridges and influence lines; deflection of beams and trusses; rigid frames by method of moment distribution. Messrs. Bramer, Griset.

C. E. 437. Theory of Structures. 5-0-0

Co-requisite: E. M. 422.

Study of design loadings for buildings, roofs and bridges. Algebraic and graphical stress analyses of roof trusses, girder and truss bridges; influence lines for moving loads, trusses with subdivided panels; portals and bents; analyses of wind loading and stresses in tall buildings; deflection of trusses and beams by method of work; continuous beams and rigid frames analyzed by slope deflection and moment distribution.

Messrs. Bramer, Griset.

C. E. 442. Soil Mechanics and Foundations. 0-3-0

Prerequisites: C. E. 373; E. M. 422.

Types of foundations, common foundation failures and frequency of occurrence; permeability and seepage, stresses in earth masses, theory of consolidation, shearing resistance and failure. Stability factors in foundations; settlement of structures. Laboratory work will supplement the lectures. Messrs. Bramer, Babcock.

C. E. 483. Engineering Contracts and Specifications. 0-0-3

Prerequisite: C. E. 401.

Lectures covering the writing of contract documents and specifications for engineering construction; duties and responsibilities of engineers and contractors on construction work; engineering ethics. Staff.

C. E. 484. Hydraulics. 0-4-0

Prerequisite: E. M. 430.

Lectures and laboratory covering uniform and non-uniform flow of water in open channels and pressure conduits; principles of design of earth reservoirs and gravity dams; flood control and water power development; theory of design and characteristics of the various types of pumps and hydraulic motors. Mr. Williamson.

C. E. 487. Hydrology and Drainage. 0-0-3

Prerequisite: C. E. 484.

Lectures covering the occurrence, distribution and use of surface and ground waters; precipitation, runoff, storage, stream flow records, design of storm drainage systems. Statistical analyses of related problems.
Mr. Williamson.

C. E. 493. Water Works. 0-0-3

Prerequisite: C. E. 484.

Lectures covering public health reasons for safe water supplies, estimating water consumption, aqueducts, design and construction of distribution systems, reservoirs, pumping stations, wells. Mr. Williamson.

C. E. 495, 496. Water Purification and Sewerage. 3-3-0

Prerequisites C. E. 487, C. E. 493.

Lectures covering water purification methods by municipal and industrial water treatment plants, principles of sedimentation, coagulation, filtration, sterilization, softening and miscellaneous treatment. Design factors. Inspection trip. Principles of design and construction of sewer systems, sewer appurtenances, pumping stations and outfalls. Design of a sanitary sewer system. Mr. Williamson.

C. E. 497. Sewage and Waste Treatment. 3-0-0

Prerequisite: Concurrent with or after C. E. 495.

Lectures covering sewage treatment methods by municipal treatment plants, public health, legal and economic problems involved, stream pollution control and industrial waste disposal. Design factors. Inspection trip.

Mr. Williamson.

Courses for Graduates Only

C. E. 525, 526, 527. Advanced Structural Design. 3-3-3

Prerequisites: C. E. 429, C. E. 442.

Co-requisite for last two terms: C. E. 532, 533.

Steel design for towers and for skeleton frame construction; reinforced concrete structures designed by the plastic theory; design of suspension bridges, reinforced concrete dams and arches; special design practice for earthquake resistance; special emphasis on the proper connection of members. Complete designs and drawings will be required for selected structures.

Mr. Griset.

C. E. 531, 532, 533. Advanced Structural Theory and Experimental Stress Analyses 3-3-3

Prerequisite: C. E. 437.

Co-requisite: Math 401a.

Stress analysis in continuous frames and arches; graphical and analytical solutions of statically indeterminate trusses; secondary stresses; space frameworks; stresses produced by foundation settlement and by earthquakes. Methods of experimental stress analysis and their limitations; interpretation of results; field or laboratory experimental work.

Mr. Bramer.

C. E. 537, 538, 539. Structural Research. 3-3-3

Prerequisite: Graduate standing in Civil Engineering.

Research and thesis on a structural problem in design or theory.

Mr. Bramer.

C. E. 541. Soil Stabilization. 3-0-0

Prerequisite: C. E. 442.

Theoretical and laboratory study of soil stabilization for highways and airports.

Staff.

C. E. 542, 543. Advanced Soil Mechanics. 0-3-3
Prerequisites: C. E. 442; E. M. 451.
Co-requisite: E. M. 502.
Load distribution and stress conditions in ideal elastic and ideal plastic soils; variations introduced by differences between actual and ideal soils; failure theories; bearing capacity of soils; capillarity, seepage, and drainage; stability of slopes; theory of consolidation with limitations and applications; subgrade reaction; structural tests on soils. Mr. Bramer.

C. E. 545, 546, 547. Soil Mechanics Research. 3-3-3
Co-requisite: C. E. 541, 542, 543.
Experimental study and thesis on a soil problem involving one of the following: stabilization; improved methods of laboratory testing; factors influencing soil behavior in foundations, subgrades or dams.
Mr. Bramer.

C. E. 551. 552, 553. Civil Engineering Seminar. 1-1-1
Prerequisite: Graduate standing in Civil Engineering.
A series of conferences and reports of students who are candidates for advanced degrees in Civil Engineering. Staff.

C. E. 561, 562, 563. Construction Methods & Equipment. 3-3-3
Prerequisites: C. E. 373, C. E. 429, C. E. 442.
A sequence analysis of the methods for the more common construction jobs of highways, foundations, buildings, dams, and bridges; correlation between design and construction practice, permissible variations; the importance of inspection; efficiency of methods, possibility of repeating operations; proper selection of equipment; design of special equipment; construction schedules. Staff.

C. E. 565, 566, 567. Construction Planning, Estimates & Costs. 3-3-3
Prerequisite: 15 credits in the field of Economics.
Co-requisite: C. E. 561, 562, 563.
Organization and management of construction plants; complete detail planning of construction jobs from actual contracts; quantity estimates; types of costs involved and sources of cost information; preparation of detailed bids from working drawings; importance of cost records for each job. Staff.

C. E. 571, 572, 573. Transportation Design. 3-3-3
Prerequisites: C. E. 373, C. E. 442.
Theory and complete layout of airports, highway intersections, grade separations and highway interchanges; fundamentals of city planning and municipal engineering as related to design problems in urban transportation and highway traffic control. Mr. Babcock.

C.E. 574, 575. Transportation Engineering Research. 0-3-3

Prerequisite: Graduate standing in Civil Engineering.

A study of the recent developments and advancements in the fields of railway, highway, and air transportation. At least one term is devoted to original research. Mr. Babcock.

C. E. 577. Highway Engineering. 0-0-3

Prerequisites: C.E. 571, 572.

Advanced pavement design; economics of private and commercial automotive transportation as it affects the economic location and design of highways. Mr. Babcock.

C. E. 578, 579. Traffic Engineering. 0-3-3

Prerequisite: C.E. 571.

Traffic studies and highway planning surveys; design remedies for the elimination of traffic accidents and traffic congestion. C.E. 579 to include an engineering report of an actual traffic survey with recommendations for the solution of the traffic problem. Mr. Babcock.

C. E. 581, 582, 583. Sanitary Engineering Research. 3-3-3

Prerequisite: Consent of the instructor.

Laboratory or other active research, under general supervision, on some problem in sanitary engineering and the preparation of a satisfactory report or thesis covering the work. The thesis must be completed one month before the end of the last term of this sequence of courses.
Mr. Williamson.

C. E. 591, 592. Sanitary Examinations and Analyses. 2-2-0

Prerequisites: Concurrent with or after C. E. 495 and C. E. 497.

Laboratories covering physical, chemical, bacteriological and microscopic examinations or analyses of water, sewage, industrial wastes and shellfish.
Mr. Williamson.

C. E. 593. Sanitary Works Design. 0-0-2

Prerequisites: C. E. 495, C. E. 497.

Design problems on water and sewage treatment plants of several types.
Mr. Williamson.

CONTEMPORARY CIVILIZATION

C. C. 101, 2, 3 Contemporary Civilization 3-3-3

Required of freshmen in engineering.

A study of the main fields of human thought in the past,—social, economic, political, philosophical, and scientific,—that form the background of men's thinking in the western world today. The purpose of the course is to give the student an understanding of the modern world, through a study of how it came to be what it is.

DAIRY MANUFACTURING (ANIMAL INDUSTRY)

Courses for Undergraduates

D.M. 203. Dairy Technology. 0-0-5

Prerequisite: Chem. 201, 202.

Methods of analysis of milk and milk products and their use in controlling the composition and quality of dairy products. Mr. Arbuckle.

D.M. 302. Ice Cream Making and Merchandising. 0-5-0

Selection and preparation of ingredients, processing and freezing of ice cream and other frozen desserts. Also, modern methods of merchandising ice cream in the retail store and at the soda fountain. Mr. Arbuckle.

D.M. 303. Cheese Making. 0-0-3

Principles and practices in the manufacture, ripening, and marketing of the various types of cheese. Mr. Arbuckle.

D. M. 313. Dairy Engineering. 3-0-0

Location, construction and arrangement of dairy plants and selection, installation and operation of dairy plant equipment. Mr. Clevenger.

D. M. 323. Judging Dairy Products. 0-0-1

Milk and dairy products judging according to official standards and commercial grades. Staff.

D. M. 333. Butter Making and Dairy By-Products. 0-0-3

Principles and practices in the manufacture of butter, condensed milk and other dairy by-products. Mr. Roberts.

D. M. s304. Dairy Products Laboratory I (Market Milk). 3 credits

Laboratory practice in the processing of market milk and related products. Staff.

D. M. s314. Dairy Products Laboratory II (Ice Cream). 2 credits

Laboratory practice in the processing of ice cream and other frozen desserts. Staff.

D. M. s324. Dairy Products Laboratory III (Butter and Cheese.) 3 credits
Laboratory practice in the processing of butter and cheese. **Staff.**

Courses for Advanced Undergraduates and Graduates

D. M. 401. Dairy Bacteriology I. **4-0-0**
Prerequisite: Bot. 312.
Importance of microorganisms in milk and dairy products. Determination of numbers and types of bacteria in dairy products and their relationship to quality. **Staff.**

D. M. 402. Dairy Chemistry. **0-3-0**
Prerequisite: D. M. 411.
Study of the chemical and physical properties of milk and its constituents. Mr. Arbuckle.

D. M. 403. Dairy Bacteriology II. **0-3-0**
Prerequisite: D. M. 401.
Investigation of techniques for identifying and culturing microorganisms which are of vital interest in dairy products. **Staff.**

D. M. 411. Market Milk. **3-0-0**
Market milk and related products from the standpoint of production, processing, distribution and public health inspection. Mr. Roberts.

D. M. 412. Dairy Plant Management. **0-3-0**
Business and factory management practices as used in the dairy plant. Mr. Clevenger.

Courses for Graduates Only

D. M. 501, 502, 503. Topical Problems in Dairy Manufacturing. **3-3-3**
Mr. Roberts.

D. M. 512. Advanced Dairy Bacteriology. **0-4-0**

D. M. 513. Advanced Dairy Chemistry. **0-0-4**

D. M. 521, 522, 523. Research in Dairy Manufacturing **1-5, 1-5, 1-5**
Mr. Roberts.

D. M. 531, 532, 533. Seminar in Dairy Manufacturing. **1-1-1**
Staff.

DIESEL ENGINEERING

Dies. 401, 402, 403. Internal Combustion Engines I 3-3-3
Prerequisite: M. E. 307.
The fundamentals common to all internal combustion engines are studied. Staff.

Dies. 408. Internal Combustion Engines Ia 3 or 3 or 3
Prerequisite: M. E. 307.
The principles of thermodynamics, applied mechanics and mechanisms as applied to the design, construction and operation of internal combustion engines. Staff.

Dies. 409. Aircraft Engines. 0-0-3
Prerequisite: M. E. 307.
Ubiquitous rather than strictly American spark-ignition, compression-ignition and jet engines are studied from the standpoint of design, construction and operation and as they apply to the airplane. Staff.

Dies. 413 Internal Combustion Fuels 3-0-0
Prerequisite: M. E. 307.
A study of solid, liquid, collodial and gaseous fuels from the standpoint of availability and suitability for internal combustion engine operation and economy. Staff.

Dies. 414 Internal Combustion Engine Lubrication 0-3-0
Prerequisite: M. E. 307.
A study of lubricants and lubrication systems as employed in internal combustion engine practice. Staff.

Dies. 421, 422 Diesel Plant Installation, Operation & Maintenance 3-3-0
Prerequisite: M. E. 307.
Current practices and procedures in the scientific selection and installation of Diesel equipment and the maintenance of Diesel power plants. Staff.

Dies. 501, 502, 503 Internal Combustion Engines II 4-4-4
Prerequisite: Dies. 403.
The several advanced phases of the internal combustion engine are studied. Staff.

Dies. 505, 506, 507 Diesel Engine Design II 5-5-5
Prerequisite: Dies. 403.
The principles of modern Diesel engine design are applied to specific problems. Staff.

Or,

Dies. 509, 510, 511. 5-5-5
Prerequisite: Dies. 403.
Principles of design applied to automotive and aircraft spark-ignition engines. Staff.

Dies. 513, 514, 515 Diesel Power Plant Design I 5-5-5

Prerequisite: Dies. 403.

The power requirements for typical industrial, municipal and institutional plants are analyzed. Laboratory work will include execution of design projects involving typical Diesel power plant installations. Staff.

Dies. 517 Design of Experimental Equipment 0-5-0

Prerequisite: Dies. 403.

The design of experimental equipment suitable for advanced test work in the Diesel field. Staff.

Dies. 521, 522. Diesel Engine Balancing Systems. 0-5-5

Prerequisite: Dies. 403.

Vibration and balancing problems as applied to the Diesel engine. Staff.

Dies. 529 Supercharger Design 3-0-0

Prerequisite: Dies. 403.

The vane, displacement, and centrifugal types of blowers, superchargers, and pressure-chargers, mechanically and turbine driver, are studied from the standpoint of design. Staff.

Dies. 530 Fuel Injector Design 0-3-0

Prerequisite: Dies. 403.

The factors influencing the design of fuel pumps and unit injectors are studied. Staff.

Dies. 541 Diesel Manufacture 3 or 3 or 3

Prerequisite: Dies. 403.

The leading Diesel manufacturing plants in America are studied with regard to their specific product and their method of manufacturing and marketing that product at the lowest cost. Staff.

Dies. 547, 548, 549. Diesel Projects. 3-3-3

Advanced experimental work involving laboratory projects dealing with the Diesel Engine. Staff.

Dies. 551, 552, 553 Seminar 1-1-1

A convocation of graduate students engaged in advanced study and research in the Diesel field. Staff.

Dies. 555, 556, 557 Research 3-3-3

Research in the Diesel Field.

ECONOMICS

Courses

Econ. 201, 202, 203. General Economics. 3-3-3

Not open to students with fewer than 45 credits.

Required of sophomores in For., juniors in Ind. Arts. Educ., Tex., seniors in Arch. Elective to others. Econ. 201, 2 required of juniors in Agr., and Teachers of Agr.

A study of economic institutions and general principles governing production and distribution of wealth under the existing economic organization.

Staff.

Econ. 212. Accounting for Engineers. 0-0-3 or 0-3-0

Required of juniors in Transportation Option of C. E., and seniors in L. A., and E. E.

A survey of accounting principles; financial statements, their construction, use, and interpretation. Mr. Shulenberger.

Econ. 301, 302, 303. Principles of Accounting. 3-3-3

Required of juniors in Ag. Econ., Ind. E., Knitting, Tex. Mgt., and seniors in Gen. E. Econ. 301, 302 required of juniors in Const. and Bldg. Materials Option of C. E., and in Yarn Mfg.

Fundamental principles of theory and practice; interpretation of the structure, form, and use of business statements. Mr. Shulenberger.

Econ. 305. Business Organization. 0-3-0

Prerequisites: Econ. 201, 202, 203 or 205.

Required of seniors in Transportation Option of C. E.

Forms of business enterprises; single enterprises, partnerships, joint-stock companies and corporations; principles of business management.

Mr. Lyons.

Econ. 307. Business Law. 3 or 3 or 3

Prerequisite: Junior standing.

Required of juniors in Cer. E. Transportation. Option of C. E., M. E., Ind. Arts Educ., seniors in Aero. Engr., Animal Production, Architectural Engr., Chemical Engr., junior and senior consolidated curriculum in Civil Engr., General Engr., Geological Engr., Industrial Engr., and fifth year in Architecture.

Sources of law; fields of law; contracts, agency sales; negotiable documents; the law as it controls business transactions.

Mr. Lyons.

Econ. 308. Advanced Business Law. **0-0-3**

Prerequisite: Econ. 307.

A continuation of Economics 307, including bailments, suretyship, real property; corporations; recent developments in State and Federal Law.

Mr. Lyons.

Econ. 311, 312, 313. Markpting Methods and Sales Management. 3-3-3

Prerequisites: Econ. 201, 202, 203 or 205.

Required of seniors in Tex. Mgt.; Econ. 311, 312 required of juniors in Farm Mkt., and Farm Fin.; Econ. 311, 312 or Econ. 320 and Econ. 331 required of seniors in Const. and Bldg. Materials Option of C. E.

Marketing functions, agencies, systems; retailing; marketing analysis; problems in marketing; elements of sales management. Mr. Moen.

Econ. 315. Advertising. **0-0-3**

Prerequisites: Econ. 201, 202, 203.

Principles of advertising. Mr. Moen.

Econ. 318. Money and Credit. **3-0-0**

Prerequisites: Econ. 201, 202, 203 or 205.

The functions, history, and development of money and credit; contemporary policies and relation to prices; interrelations of money and credit in banks and financial institutions. Mr. Moen.

Econ. 319. Modern Banking. 0-3-0

Prerequisites: Econ. 201, 202, 203 or 205.

Origin and development of banking in the United States; functions and operations of the modern bank; banking laws; Federal Reserve System.

Mr. Moen.

Econ. 320. Corporation Finance. 0-0-3

Prerequisites: Econ. 201, 202, 203.

Alternate requirement in Const. and Bldg. Materials Option of C. E.

Raising and spending of funds and standards of control. Mr. Moen.

Econ. 325, 326. Industrial Management. **3-3-0**

Prerequisites: Econ. 201, 202, 203.

Required of seniors in Aero. E. and Textiles, elective for all others.

Principles and techniques of modern scientific management; relationship of finance, marketing, industrial relations, accounting, and statistics to production; techniques regarding specific problems; analysis of economic, political, and social influences on production. Mr. Wood.

Econ. 331. Labor Problems. 3-0-0

Prerequisites: Econ. 201, 202, 203 or 205.

Required of juniors in Ind. Educ., and seniors in Ind. Arts Educ. Alternate requirement in Const. and Bldg. Materials Option of C. E.

An economic approach to labor problems, including such topics as insecurity, wages, hours, working conditions, substandard workers, legislation aimed at correcting existing evils. Mr. Wood.

Econ. 332. Industrial Relations. 0-3-0

Prerequisites: Economics 201, 202, 203.

Collective bargaining. Analysis of basis labor law and its interpretation by courts and government agencies. Examination of specific terms of labor contracts and their implications for labor and management. Examination of labor objectives and tactics and management objectives and tactics.

Mr. Wood

Econ. 333. Personnel Management. 3 or 3 or 3

Prerequisites: Econ. 201, 202, 203 or 205.

Required of seniors in Const. and Bldg. Materials Option of C. E., and Tex.

Emphasis on the human problems of industry. A review of the scientific techniques and results of research regarding the problems of employment; training, promotion, transfer; health and safety; service and welfare; and joint relations. Mr. Wood.

Econ. 335. Time Study. 0-3-0

Prerequisites: Econ. 201, 202, 203.

Analysis of shop operation into elements, and the determination of the time for each element; emphasis on factors affecting job specification, and wage-rate setting. Mr. Wood.

Econ. 340. Transportation Problems. **0-0-3**

Prerequisites: Econ. 201, 202, 203.

The economic aspects of transportation facilities provided by the railroads, highways, and air- and water-transportation agencies; principles and problems of rate making, operation, management, valuation, coördination and government regulation. Mr. . . . .

Econ. 401. Advanced Accounting. **3-0-0**

Prerequisites: Econ. 301, 302, 303.

Problems of asset valuation, such as depreciation, replacements, amortization, etc., found in all types of business organizations. Mr. Shulenberger.

Econ. 404, 405. Principles of Cost Accounting. **0-3-3**

Prerequisites: Econ. 301, 302, 303.

Required of seniors in Textile Management.

Cost finding, material costs, labor costs, overhead costs, etc.

Mr. Shulenberger.

Econ. 408. Survey of Statistical Methods. **3 or 3-0**

Prerequisites: Econ. 201, 202, 203 or 205.

Methods of describing quantitative data; collection and methods of analysis of statistical materials; charts and graphs for presenting numerical facts. Mr. Leager.

Econ. 409. Statistical Technique. **0-3-0**

Prerequisite: Econ. 408.

The problem of estimation, correlation; simple linear and nonlinear forms; normal curve and probable error; methods of sampling.

Mr. Leager.

Econ. 414. International Economic Relations. **0-0-3**

Prerequisites: Econ. 201, 202, 203 or 205.

Backgrounds and some newer developments in international economics, with special emphasis on the position of the United States in world trade.

Econ. 415. Investment Problems and Policies. **0-3-0**

Prerequisites: Econ. 201, 202, 203 or 205.

Different types of investments and methods of judging them. Managing personal finances. Mr. Moen.

Econ. 416. Public Finance and Taxation. **0-3-0**

Prerequisites: Econ. 201, 202, 203.

Classes of income and expenditure; incidence of different classes of taxes. **Mr. Moen.**

Econ. 418. Principles of Insurance. **0-0-3**

Prerequisites: Econ. 201, 202, 203.

Elective.

Risk as an element of all agricultural and industrial activity; discussion of such risks as can be covered by insurance with the appropriate form of insurance, e.g., employer's liability, workmen's compensation, fire, life, and other forms. Mr. Shulenberger.

Econ. 421. Office Management 3 or 3 or 3

Prerequisites: Open to seniors and graduate students only.

The application of scientific management principles to office problems including: office planning and layout, equipment appliances, filing, correspondence supervision, selection and training of office employers, promotions and wage increases, office costs and budgets. Mr. Wood.

Econ. 431, 432, 433. Management of Industrial Relations. 3-3-3

Prerequisites: Open to seniors and graduate students only.

A seminar course;

An examination of the entire field of industrial relations. Economic, social, labor and management's points of view. The relation to and effects of industrial relations on management problems and policies.

Mr. Wood.

Econ. 501. Advanced Economic Theory. 3-3-0

Prerequisite: Eighteen (18) term credits in Economics.

Recent and current economic theory; principal schools of economists; **theory of prices under the system of free enterprise.** **Staff.**

Econ. 502. History of Economic Doctrines. 0-0-3

Prerequisite: Econ. 501.

History of economic doctrines from the Mercantilists to the period of Ricardo. **Staff.**

EDUCATION: TEACHER EDUCATION

AGRICULTURAL EDUCATION

Ed. 308. Visual Aids. **0-0-3**

Prerequisite: Junior standing.

Required of students in Education.

Methods and technique of visual instruction; lettering; statistical illustrating; chart, graph, and poster-making; photography; projector operation, care, and use. Designed for teachers and extension workers.

Mr. Armstrong.

Courses for Graduates and Advanced Undergraduates

Ed. 406. Principles of Teaching. 3-0-0

Prerequisite: Ed. 303 or 304.

Required of seniors in Agr. Ed.

Principles of teaching with applications to vocational agriculture; personal requisites of a teacher; responsibilities; objectives of teaching; school control; motivation; directing study. Messrs. Cook, Armstrong, Nylund.

Ed. 407. Methods of Teaching Agriculture. 5-0-0

Prerequisites: Ed. 303, 308, or equivalents, and at least 12 credits in Agriculture.

Required of students in Agricultural Education.

Organization of subject matter; teaching techniques; supervised practice; textbooks and reference material; Future Farmers of America; organization of departments of vocational agriculture; agricultural guidance.

Messrs. Cook, Armstrong, Coggin, Nylund.

Ed. 408. Observation and Directed Teaching. 5 or 5 or 5

Prerequisites: Ed. 406, 407, and at least 12 credits in Agriculture.

Required of seniors in Agr. Ed.

Observation and teaching vocational agriculture under supervision; participation in the varied activities of the teacher of vocational agriculture.

Staff.

Ed. 411. Evening Classes and Directed Teaching. 5 or 5 or 5

Prerequisites: Ed. 406, 407, and at least 12 credits in Agriculture.

Required of seniors in Agr. Ed.

Community activities of teachers of vocational agriculture; organization, method, and directed teaching of evening and part-time classes. Staff.

Ed. 412. Materials and Methods in Teaching Agriculture. 5 or 5-0

Prerequisites: Ed. 406, 407, and 12 credits in Agriculture.

Required of seniors in Agr. Ed.

Use of illustrative and actual materials in teaching vocational agriculture; collection and preservation of specimens; chart making; practice in use of materials in directed teaching. Mr. Armstrong.

Ed. 426. Secondary Education in Agriculture. 0-0-3

Prerequisites: Ed. 303 or 304, and 6 other credits in Education.

Agricultural education in the United States; school organization; agricultural occupations. Mr. Cook.

Ed. 460. Special Problems in Teaching Agriculture. 3 or 3 or 3

Prerequisites: Ed. 406, 407, or equivalent.

Planning programs of work and courses of study; collecting and preparing materials for teaching; making teaching plans. Staff.

Ed. 461 (a-b). Trends in Teaching Vocational Agriculture. 3 or 6 credits

Prerequisites: 18 credits in Education, including 5 in Agricultural Education.

Procedures in teaching vocational agriculture; out-of-school farm youth; evening-class instruction and the F. F. A. Staff.

Ed. 462 (a-b). Course of Study Problems. 3 or 6 credits

Prerequisites: 18 credits in Education, including 5 in Agricultural Education.

Selection and organization of subject matter in vocational agriculture; supervised practice. Staff.

Ed. 463 (a-b). Guidance and Individual Instruction. 3 or 6 credits

Prerequisites: 18 credits in Education, including 5 in Agricultural Education.

Individualized instruction applied to vocational agriculture; agricultural occupations, guidance, and counseling with special reference to pupils in vocational agriculture. Staff.

Courses for Graduates Only

Ed. 516. Problems in Agricultural Teaching. **3 or 3 or 3**

Prerequisites: Ed. 407, and at least 12 other credits in Education and Agriculture. Experience in Agricultural Teaching will be accepted in lieu of Ed. 407.

Investigations, reports, and a critical evaluation of present practices; course adapted to individual interests and needs.

Messrs. Cook, Armstrong, Coggin, Nylund.

Ed. 517. Principles of Agricultural Education. **3 or 3 or 3**

Prerequisite: Eighteen credits in Education and Agriculture. Permission to register.

Principles and practices in agricultural education in the light of educational research and of changing rural conditions.

Messrs. Cook, Nylund.

Ed. 520. a, b, c. Agricultural Education Seminar. **1-1-1**

Prerequisite: Eighteen credits in Education.

A critical review of current articles and books of interest to students of agricultural education. Staff.

Ed. 521. a, b, c. Research in Education. 3-3-3

Prerequisite: Eighteen hours in Education and permission to register.

One or more research problems under the guidance of a member of the staff. Staff.

INDUSTRIAL EDUCATION

AND

INDUSTRIAL ARTS

Ed. (I.A.) 105 a, b, c. Industrial Arts Drawing. **3-3-3**

Required of freshmen in Industrial Arts Education.

Fundamentals of pictorial representation, such as layout work, machine, and architectural drawing. Mr. Hostetler.

Ed. (I.A.) 106 a, b, c. Orientation in Industrial Arts. **3-3-3**

Required of freshmen in Industrial Arts Education.

Provides initial experiences for students interested in teaching Industrial Arts in the secondary school; emphasizes the importance and relation of Industrial Arts to other areas in the school and to individual development.

Mr. Hostetler.

Ed. (I.A.) 205. Industrial Arts Design. **0-0-3**

Prerequisite: Ed. (I. A.) 105, a, b, c.

Required of sophomores in Industrial Arts Education.

Design and construction in a variety of industrial materials; stressing individual expression and appreciation of well designed industrial products.

Mr. Hostetler.

Ed. (I.A.) 206 a, b, c. Laboratory Problems in Industrial Arts. **3-3-3**

Prerequisites: Ed. (I. A.) 105 a, b, c, and I. A. 106 a, b, c.

Required of sophomores in Industrial Arts Education.

Explorations in drawing, planning, woodwork, metal work, and electricity.

Mr. Hostetler.

Ed. (I.A.) 306 a, b, c. Laboratory Problems in Industrial Arts. **3-3-3**

Prerequisites: Ed. (I. A.) 105 a, b, c; Ed. (I. A.) 106 a, b, c, and Ed. (I. A.) 206 a, b, c.

Required of all juniors in Industrial Arts Education.

Advanced hand and machine tool techniques in printing, electricity, and metal work; stressing the development of master craftsmanship and an understanding of related social-economic problems. Mr. Hostetler.

Ed. 344. Problems in Secondary Education. **3-0-0**

Prerequisites: Ed. 303, and 6 other credits in Education.

Required of juniors preparing to teach industrial subjects.

Problems of secondary education, with special reference to the relationships of industrial subjects with the other elements of the school program.

Staff.

Courses for Graduates and Advanced Undergraduates

Ed. 416. Local Survey; Planning a Program. **0-3-0**

Methods of surveying local occupations; use of the findings to plan a program of Industrial Education. Mr. Beres.

Ed. 422. Methods of Teaching Industrial Subjects. 3-0-0

Prerequisites: Ed. 304, 344.

Required of seniors in Industrial Arts Education and those preparing to teach vocational classes in trades and industries.

Principles of teaching in the classroom or shop; intended for those who are teaching or preparing to teach shop and drawing courses. Staff.

Ed. 427. Philosophy of Industrial Education. 0-3-0

The philosophy of industrial education, a review of Federal and State legislation pertaining to industrial education; part-time, all-day trade, general industrial, and evening schools. Mr. Beres.

Ed. 433. Field Work in Secondary Education. 0-3-0

Prerequisites: Ed. 344, and 6 credits in Education.

Required of juniors in Industrial Arts Education.

A study of pupil-teacher-community relationships at the secondary school level involving observations, visits, reports, readings, and conferences. Staff.

Ed. 440. Vocational Education. 3 or 3 or 3

Prerequisites: Ed. 303, 344, and 6 additional credits in Education.

Elective for students in Industrial Arts and Industrial Education.

Problems of vocational education; underlying philosophy; its place in our system of education; the laws governing prevailing practices and administration; agricultural, homemaking, industrial, and commercial vocations; deals with all-day, evening, part-time, and general continuation class work. Staff.

Ed. 444. Observation and Directed Teaching of Industrial Subjects. 3-3-0 or 0-3-3

Prerequisites: Ed. 422, 433.

Required of students who desire an "A" grade certificate to teach industrial subjects.

Observation of and active participation in phases of teacher activity; students will work in actual situations under supervision. Staff.

Ed. S., Ex. 452. Industrial Arts in the Elementary School. 3 or 3 or 3

Prerequisite: 12 credits in education and the consent of the instructor.

For advanced undergraduate and graduate students; organized to help students gain insights into the materials, processes, and products of industry fundamental to an understanding of major problems of living. Staff.

Ed. (I.A.) 470 a, b, c. Laboratory Problems in Industrial Arts. 3 or 3 or 3

An elective course for undergraduates and graduates with consent of the instructor.

Advanced laboratory conducted on general shop or laboratory of industries basis. Mr. Hostetler.

Ed. S., Ex. 480. Modern Industries. 3 or 3 or 3

Prerequisites: 12 credits in education and consent of the instructor.

Elective course for advanced undergraduate and graduate students in industrial arts. Designed to assist teachers in guiding students to sources of information relative to various modern industries. Staff.

Ed. 482. Curriculum Problems in Industrial Arts. 3-0-0

A course for advanced undergraduate and graduate students in Industrial Arts Education.

Planning and organizing of learning experiences in the Industrial Arts area. Mr. Hostetler.

Ed. 483. Instructional Aids and Devices. 0-3-0

Prerequisites: Ed. 304, and 6 other credits in Education.

Required of those intending to teach Industrial Arts or Industrial Education, and those who because of trade experience desire to teach trade subjects.

Analysis of learning units, and the preparation of instructional aids and devices. Mr. Hostetler.

Ed. 484. Laboratory Planning and Equipment Selection. 0-0-3

A course for advanced undergraduate and graduate students.

The physical planning of school shops and laboratories; selection of tools and equipment. Whenever possible, actual or contemplated school buildings will be used for class work. Staff.

Ed. 492. Individual Problems in Education. 3 or 3 or 3

An elective course for graduate students in Industrial Arts Education and Industrial Education, with consent of instructor.

Individual and group studies of one or more major problems in Industrial Arts and Industrial Education. Problems will be approached through the application of research techniques with final reports prepared in a form suitable for publication as a magazine article, technical or professional bulletin. Staff.

Courses for Graduates Only

Ed. 510. Administration and Supervision of Vocational Education.
Prerequisites: Ed. 304, 344, 420, 440, or equivalent. 3 or 3 or 3
For graduate students majoring in Education.
Administrative and supervisory problems of vocational education; practices and policies of Federal and State offices; organization and administration of city and consolidated systems. **Staff.**

Ed. 514. Modern Principles and Practices in Secondary Education. 3 or 3 or 3
Required of graduate students in Guidance, Industrial Arts, and Industial Education.
Foundations of modern programs of secondary education; purposes, curriculum, organization, administration, and the place and importance of the high school in the community in relation to contemporary social forces. Mr. Hostetler.

Ed. 521. Research in Education. 3 or 3 or 3
The student will make a study of one or more research problems under the supervision of some member of the staff of the Department of Teacher Education. The course will be selected on the recommendation of the member of the faculty with whom the student plans to carry on the study. **Staff.**

Ed. 530. Philosophy of Industrial Arts. 3 or 3 or 3
Required of all graduate students in Industrial Arts Education; elective for others with consent of the instructor.
Current and historical developments in Industrial Arts; philosophical concepts, functions, scope, criteria for the selection and evaluation of learning experiences, laboratory organization, student personnel programs, community relationships, teacher qualifications, and problems confronting the Industrial Arts profession. Mr. Hostetler.

INDUSTRIAL AND RURAL RECREATION

Courses for Undergraduates

Rec. 101. Introduction to Physical Education. **3-0-3**
Required of freshmen in Industrial and Rural Recreation; elective for others.
Introduces the students to the program of physical education; its definition, aim, and objectives; its scientific foundations; and its activities. The significant problems of an organized program of physical activities relative to industrial and rural recreation are studied. The professional outlook of the physical educator in recreation is presented. Mr. Hines.

Rec. 102. Gymnastics and Stunts. 0-3-0

Required of freshmen in Industrial and Rural Recreation; elective for others.

This course stresses the learning of skills; the selection of activities and appropriate methods of instruction; the techniques and skills for teaching of apparatus, fundamental gymnastics, marching, stunts, and tumbling.

Mr. Hines.

Rec. 103. Theory of Play. 0-0-3

Required of freshmen in Industrial and Rural Recreation; elective for others.

This course presents the modern theoretical interpretations of the constructive value of play by providing a study of the historical background of the present play movement, of the theoretical explanation of play, of the need for play in modern life, and of the organization and administration of organized play. Mr. Hines.

Rec. 201. Games of Low Organization. 0-3-0

Required of sophomores in Industrial and Rural Recreation; elective for others.

This course emphasizes the learning of games, contests, relays; the selection of activities adaptable to the recreational needs of the age levels of the child, youth, and adult; methods of presentation; and motivation means best suitable to games of low organization. Mr. Hines.

OCCUPATIONAL INFORMATION AND GUIDANCE

Courses for Graduates and Advanced Undergraduates

Ed. 420. Principles of Guidance. 0-3-0

This course aims to help teachers, administrators, and other non-specialists to do better the guidance work for which they are responsible. The course will cover the principles and procedures of Guidance programs at the secondary school level. Consideration will be given to counseling with individuals regarding health, social, emotional, educational, and vocational problems. Mr. Anderson.

Ed. 424. Occupational Studies. 0-0-3

This course is intended to acquaint individuals with the field of occupational information. An analysis will be made of the various types of occupations and occupational trends in North Carolina and the country as a whole.

Mr. Anderson.

Ed. 481. Character Education. 0-0-3

Prerequisite: 12 credits in Education.

Factors influencing character development; opportunities and responsibilities of the school for the conception and attitudes fundamental to good conduct, trends, materials, and procedures. Mr. Cook.

Ed. 490. Individual Problems in Guidance 0-3-0

Intended for individual or group studies of one or more of the major problems in Guidance and Personnel work. Problems will be selected to meet the interests of individuals. The workshop procedure will be used whereby special projects and reports will be developed by individuals and by groups. Mr. Anderson.

Courses for Graduates Only

Ed. 531. Educational and Vocational Guidance 3-0-0

This course aims to provide training for teachers who are part time or full time counselors, employment interviewers, social workers and personnel workers, who are aiding individuals with vocational adjustment problems. The course will cover the functions performed in vocational and educational guidance such as assembling and imparting occupational information, counseling regarding vocational and educational plans, the use of aptitude tests, placement in jobs and follow-up, and procedures in setting up services of vocational and educational guidance in schools, employment offices, and social service agencies. Mr. Anderson.

Ed. 532. Occupational Analysis. 0-3-0

This course is designed to aid counselors, employment workers, personnel managers, and research workers to study occupational trends and to make occupational studies. An analysis and an evaluation of the techniques and of the research will be made in the field of job analysis, job evaluation and job specifications. Implications for curriculum building and industrial and industrial personnel are considered. Mr. Anderson.

Ed. 533. Techniques in Guidance and Personnel. 0-0-3

The aim of this course is to develop personnel techniques for counselors, social workers, employment interviewers, and industrial personnel workers. The techniques to be studied intensively are observation, interviews, counseling, rating scales, records and reports, and case study procedures. Students become acquainted with these techniques through lectures, demonstrations, and the study of case histories. Attention will be given to both diagnosis and treatment. Mr. Anderson.

Ed. 541. a, b, c. Field Work in Occupational Information and Guidance. 3 or 3 or 3

A practical course in which the student undertakes field work in secondary schools, colleges, social service agencies, employment offices, and industrial establishments which carry on guidance and personnel work. The student may observe and participate in some personnel services and may study the organization and administration of Guidance Programs. Mr. Anderson.

Ed. 551. a, b, c. Research in Occupational Information and Guidance. 3-3-3

Qualified students will conduct investigations in Guidance and Personnel. Published reports and techniques of investigation will be analyzed and evaluated. Staff.

PSYCHOLOGY
(Educational and Adolescent)

Ed. 303, 304. Educational Psychology. 3-3-0

(For description of course see Psychology 303, 304) Mr. Johnson.

Ed. 476. Psychology of Adolescence. 0-0-3

(For description of course see Psychology 476) Mr. Moffie.

ELECTRICAL ENGINEERING

Courses for Undergraduates

E. E. 201, 202. Electrical Engineering Fundamentals. 0-3-3

Prerequisites: Math 201, Physics 201.

Required of sophomores in E. E. concurrent with Physics 202, 203.

Fundamental laws of electric, magnetic, and dielectric circuits; problem drill. E. E. Staff.

Courses for Advanced Undergraduates

E. E. 301, 302, 303 Alternating Current Circuits and Lines 3-3-3

Prerequisites: E. E. 202, Math. 202.

Required of Juniors in E. E.

The theory of periodic currents, alternating-current circuits and systems. Elementary network theory. Introduction to transformer theory. Polyphase systems. Non-periodic e.m.f.'s and currents. The theory of electrical transmission lines. E. E. Staff.

E. E. 305 Direct Current Machinery 3 or 3 or 3

Prerequisite: E. E. 202.

Required of Juniors in E. E.

Principles, performance, and characteristics of direct-current machinery and auxiliary equipment. E. E. Staff.

E. E. 311, 312 Dynamo Laboratory 0-1-1 or 1-1-0

Required of Juniors in E. E. Concurrent with E. E. 301-2 and E. E. 305.

A coordinated laboratory course supplementing the classroom work in E. E. 301, 302, 303, and 305. Experimental studies and tests on D. C. and A. C. circuits and on D.C. motors and generators. E. E. Staff.

E. E. 317, 318 Electrical Measurements 0-1-1 or 1-1-0

Prerequisite: E. E. 202.

Required of Juniors in E. E. Concurrent with E. E. 301.

A laboratory course in the techniques and instruments involved in the precise measurement of electrical quantities. E. E. Staff.

E. E. 320, 321, 322 Elements of Electrical Engineering 3-3-0 or 3-3-3

Prerequisites: Math 202, Phys. 203.

Required of Juniors in Aero. E., Chem. E., C. E., and Geol. E., and of Seniors in Cer. E., Gen. E., I. E., and M. E.

A survey of the principles of Electrical Engineering, including the study of direct and alternating current circuits and machinery and the basic principles of electronics. E. E. Staff.

E. E. 325, 326, 327 Electrical Engineering Laboratory 1-1-0 or 1-1-1

Required of Juniors in Aero E., Chem. E., C. E., and Geol. E., and of Seniors in Cer. E., Gen. E., I. E., and M. E.

A laboratory course coordinated and concurrent with E. E. 320, 321, 322. E. E. Staff.

E. E. 343 Electrical Equipment of Buildings 0-0-3

Prerequisite: Phys. 203.

Required of Seniors in Architectural Engineering.

Wiring of buildings for light and power; selection of motors for elevators, air-conditioning, etc. Design of lighting installations.

Messrs. Lear and Winkler.

Courses for Graduates and Advanced Undergraduates

E. E. 401, 402 Alternating Current Machinery 3-3-0

Prerequisite. E. E. 303.

Required of Seniors in E. E.

Principles and characteristics of single and polyphase transformers, induction motors, and synchronous machines. Mr. Fouraker.

E. E. 403 Electric Transmission 3-0-0 or 0-3-0

Prerequisites: E. E. 303, Math. 303.

Optional, for E. E. Seniors, with E. E. 425.

Long distance transmission of power. Determination of line constants by the method of geometric mean distances. The general circuit constants and equations. Regulation, loss, and efficiency prediction by circle diagrams. Mr. Stevenson.

E. E. 405 Electric Transients 3-0-0

Prerequisites: E. E. 302, Math. 401a.

Required of Seniors in E. E.

An introductory study of the transient behavior of electrical circuits and machinery; switching transients and pulsed linear networks. Operational methods of analysis are emphasized. Messrs. Brennecke and Hoadley.

E. E. 407 Electromagnetic Fields 0-3-0

Prerequisites: E. E. 302, Math 401a.

Required of Seniors in E. E.

A re-survey of the classical theory of electricity and magnetism and its application to the problems of electrical engineering. The viewpoint of vector analysis is used throughout. Static fields; potential and force fields; field calculations and plotting; Maxwell's Equations; introduction to guided waves and radiant fields. Messrs. Brennecke and Hoadley.

E. E. 411, 412, 413 Advanced Dynamo Laboratory 1-1-1

Required of Seniors in E. E. Concurrent with E. E. 401, 402.

Experimental studies and tests on transformers, alternating current motors and generators, and transmission lines. E. E. Staff.

E. E. 415a, 416a Fundamentals of Electronics 3-3-0

Prerequisites: For E. E. 415a, Physics 203 and Math. 303; for E. E. 416a, E. E. 301 and E. E. 415a.

Required of Juniors in E. E.

A study of the fundamentals of electrical conduction in vacua and gases. Operating characteristics of vacuum and gaseous tubes, mercury arc rectifiers, photoelectric cells, cathode-ray oscilloscopes, etc. Introduction to vacuum tube circuit theory. E. E. Staff.

E. E. 415b, 416b Electronic Laboratory I and II 0-1-1
Prerequisite: E. E. 415a.
Required of Juniors in E. E. Concurrent with E. E. 416a.
A laboratory course designed to illustrate the principles studied in E. E. 415a and 416a. E. E. Staff.

E. E. 417 Industrial Electronics and Control 3 or 3 or 3
Prerequisites: E. E. 416a, 416b.
A study, with laboratory tests, of the application of electronic devices to industrial processes and equipment outside the field of Communication. Speed and voltage control; timing devices; electronic heating; air purification; production and quality control; photoelectric devices. Mr. Glenn.

E. E. 422 Electric Power Applications 0-0-3
Prerequisite: E. E. 402.
Optional, for E. E. Seniors, with E. E. 426.
Design and selection of electrical equipment for various industrial applications: mine hoists, electric traction, steel mills, etc. Speed control.
Mr.Stevenson.

E. E. 424. Central Stations 0-0-3
Prerequisites: M. E. 309, E. E. 402.
Required of Seniors in E. E.
Layout and operation of steam and hydroelectric stations. Prime movers and auxiliary equipment; bus systems, switchgear, etc. Management, plant economics, rate making, federal regulations. Mr. Fouraker.

E. E. 425, 426. Electric Communication 0-3-3
Prerequisites: E. E. 303, 416a, 416b.
Optional, for E. E. Seniors, with E. E. 403 and 422.
A classroom and laboratory study of the circuits and equipment involved in radio and wire communication: amplifiers, oscillators, modulation and detection, etc. Mr. Carson.

E. E. 437. Illumination 0-0-3
Prerequisite: E. E. 302.
A classroom and laboratory study of the principles involved in the production and utilization of light from artificial sources. Photometric methods, units, and standards. Incandescent, gaseous-conduction, and fluorescent sources. Design of indoor and outdoor lighting installations. Mr. Lear.

E. E. 445, 446, 447. Electrical Engineering Pro-Seminar 1-1-1
Prerequisite: Senior Standing.
Required of Seniors in E. E.
Weekly meetings for the delivery and discussion of student papers on topics of current interest in Electrical Engineering. Mr. Brennecke.

E. E. 453. Power Network Calculations. 0-3-0
Prerequisite E.E. 303.
The method of symmetrical components applied to fault calculation in power system networks. Equivalent impedances of short and long lines

with and without terminal grounding and for ground wires, transformer banks, synchronous machines, asynchronous machines. Syntheses of complete systems, with calculations of fault currents for different types of faults.
Mr. Stevenson.

Courses for Graduates Only

E. E. 505, 506, 507. Electrical Engineering Seminar 1-1-1

Prerequisite: Graduate standing in E. E.

A series of papers and conferences participated in by the instructional staff, invited guests, and students who are candidates for advanced degrees. Mr. Hoadley.

E. E. 508. Power System Stability 0-3-0

Prerequisite: Graduate standing in E. E.

Power limits of rotating machinery. Criteria for steady state stability. Discussion of transient stability. Stability and the long distance transmission of power. System design. Mr. Stevenson.

E. E. 509. Advanced Alternating Current Machinery 0-0-4

Prerequisite: Graduate standing in E. E.

Classroom and laboratory study of advanced methods of machine analysis. Balanced and unbalanced conditions. Transient impedances and time constants. Approximate and rigorous solutions. Mr. Fouraker.

E. E. 510. Transmission Line Transients 0-4-0

Prerequisite: Graduate standing in E. E.

Guided traveling waves; their initiation, reflection, attenuation and distortion. Lightning and switching surges on lines. Protective devices.
Mr. Brennecke.

E. E. 511, 512, 513 Communication Networks 3-3-3

Prerequisite: Graduate standing in E. E.

Characteristics of two and four terminal networks. Foster's Cauer's, and Bartlett's theorem. Transformation by matrix manipulation. Long lines, wave filters, simulative and corrective networks. Mr. Hoadley.

E. E. 515. Microwave Electronics 4-0-0

Prerequisite: Graduate standing in E. E.

Classroom and laboratory study of electronic devices used for the generation, amplification, modulation and keying of ultra-high frequencies: klystrons, magnetrons, lighthouse and doorknob tubes, and their associated circuits. Mr. Carson.

E. E. 519, 520. Wave Guides and Cavities 3-4-0

Prerequisite: Graduate standing in E. E.

Electromagnetic wave theory applied to wave guides, cavity resonators, coaxial lines, horn and parabolic reflectors. General study of transmission, radiation, and impedance matching at ultra-high frequencies. Associated laboratory work. Mr. Carson.

E. E. 525. Radiation and Antennas 0-0-4

Prerequisite: Graduate standing in E. E.

Electromagnetic wave theory applied to antennas and antenna arrays. Calculation and measurement of field patterns. Directive and non-directive antennas of various sorts.

E. E. 527. Servomechanisms 4-0-0

Prerequisite: Graduate standing in E. E.

The fundamental theory of closed-cycle control systems. The analysis of a servomechanism as a feed-back amplifier. Stability, performance, design, and applications. Laboratory work.

E. E. 535. High Voltage Engineering 0-0-3

Prerequisite: Graduate standing in E. E.

A study of the considerations entering the design of electrical equipment for use at high potentials. Insulators and insulation design. Corona loss and surface leakage. Methods of measurement and test at high potentials.

E. E. 536. Dielectrics and Insulating Materials 0-3-0

Prerequisite: Graduate standing in E. E.

The behavior of electrical insulating materials as dielectrics. The theory of solids applied to dielectric conduction and breakdown. The electrical properties and uses of oils, silicates, plastics, ceramics, etc.

E. E. 537, 538, 539. Power Networks and Relaying 3-3-3

Prerequisite: Graduate standing in E. E.

The study of unsymmetrical systems by the method of symmetrical components. Network reduction, sequence impedances of lines and transformers, the calculation of fault currents and voltages. The application of network calculations to the problems of relaying. The application of instrument transformers to relay systems. Differential relaying problems. Pilot systems of relaying. Mr. Stevenson.

E. E. 540, 541, 542. Project Work in E. E. 1-1-1

Prerequisite: Graduate standing in E. E.

Required of candidates for the M.E.E.

Individually assigned design, construction, or analytical projects, performed by the student under the guidance of the instructor. A report on the year's work, meeting the specifications of the Graduate School for the Master's Thesis, is required. Graduate Advisers.

E. E. 550. Electrical Engineering Research 3-3-3

Prerequisite: Graduate standing in E. E., and approval of adviser.

Individual research in the field of Electrical Engineering.

Graduate Advisers.

ENGINEERING MECHANICS

Courses for Advanced Undergraduates

E. M. 311. Engineering Mechanics. 3-0 or 3

Prerequisites: Math. 201; Phys. 201.

Required of all students in Engineering.

Statics and Friction: Study of concurrent, parallel and nonconcurrent systems of both coplaner and noncoplaner forces; the application of statics to the solution of fundamental engineering problems, including statical friction. **Staff.**

E. M. 312. Engineering Mechanics. 3 or 3-0

Prerequisites: E M. 311 and Math. 202.

Required of all students in Engineering.

Kinematics; centroids, moments of inertia. Staff.

E. M. 313. Engineering Mechanics. 0-3 or 3

Prerequisites: E. M. 312 and Math. 303.

Required of all students in Engineering.

Kinetics: The motions of particles of rigid bodies as they are affected by the action of unbalanced forces. The Newtonian laws of motion; work and energy; power, impulse and momentum; applications to special engineering **problems.** Staff.

E. M. 321. Strength of Materials. 3 or 3 or 3

Prerequisites: E. M. 312; Math. 303.

Required of all students in Engineering.

Stresses and strains in engineering materials; tension, compression, shear, and torsion; emphasis on the applications to engineering structures; bending moments and shear in simple beams; fibre stresses in beams and their distribution throughout the cross section. Staff.

Courses for Graduates and Advanced Undergraduates

E. M. 422. (Formerly E. M. 322) Strength of Materials. 3-0 or 3

Prerequisite: E. M. 321.

Required of students in Arch. E., C. E., Gen. E., M. E.

A continuation of E. M. 321. Various methods for finding the slope and deflection of beams; determination of stresses in statically indeterminate beams; the study of columns, combined stresses; energy of strain.

Messrs. Smith, Conner, Mitchell, Feltner.

E. M. 430. (Formerly E. M. 330) Fluid Mechanics. 3-0 or 3

Prerequisite: E. M. 313.

Required of students in C. E., E. E., Gen. E., Geol. E., M. E.

A study of the fundamental principles of mechanics of fluids; properties of fluids; intensity of pressure; hydrostatic pressure on areas; applications of hydrostatics; kinematics of fluid flow; dynamics of fluid flow; applications of hydrokinetics; friction losses in pipes; flow through pipes; dynamic forces. Messrs. Feltner, Long.

E. M. 431. (Formerly E. M. 331) Hydraulic Machinery. 3-0-0

Prerequisite: E. M. 430.

Elective for Engineering seniors and graduate students.

The application of the principles of fluid mechanics to hydraulic pumping and power machinery; impulse and reaction type turbines; turbine laws and factors; water power plants; pumping and machinery; centrifugal pumps; efficiency, capacity and selection of pumps. Mr. Feltner.

E. M. 435. Fluid Mechanics Laboratory. 1-0-0

Co-requisite: E. M. 430.

Required of students in C. E.

Laboratory instruction consisting of demonstrations and experiments by students. The course is designed to aid in the presentation of some of the principles studied in Fluid Mechanics, such as fluid properties and flow phenomena. Mr. Feltner.

E. M. 451. (Formerly E. M. 401) Advanced Strength of Materials. 3-0-0

Prerequisite: E. M. 422.

Elective for Engineering seniors and graduate students.

A course offered as a basis for advanced subjects in the several departments of the Engineering School. The subject matter covers the studies of stress at a point by the use of Mohr's Circle, springs, curved bars, shear flow, and deformations beyond the elastic limit. Messrs. Smith, Mitchell.

E. M. 454. (Formerly E. M. 404) Vibration Problems. 0-0-3

Prerequisites: E. M. 422, Math. 431a or 431b.

Elective for Engineering seniors and graduate students.

Free vibrations without damping; forced vibrations without damping; free vibrations with viscous damping; forced vibrations with damping; steady state forced vibrations with damping; vibration of systems with several degrees of freedom; vibration isolation and absorption; vibrating instruments; equivalent systems; balancing. Mr. Mitchell.

E. M. 456. Advanced Mechanics. 0-3-0

Prerequisite: E. M. 313.

Elective for Engineering seniors and graduate students.

Principle of virtual work; Coriolis' law of motion; gyroscopic action; balancing; variable acceleration; differential equations of motion; applications to engineering problems. Messrs. Smith and Feltner.

Courses for Graduates Only

E. M. 501. Strain Energy Methods of Stress Analysis. 0-3-0

Prerequisite: E. M. 422.

The application of strain energy for the evaluation of deflections and statically indeterminate reactions resulting from axial, transverse, and torsional loads on beams, trusses, rigid frames, and curved members. Messrs. Smith and Mitchell.

E. M. 502. Elastic Stability. 0-0-3

Prerequisites: E. M. 422, Math. 431a or 431b.

A practical study of beams supported by an elastic foundation, beam columns, and buckling problems. The application to design problems in calculating critical loads on columns, beam columns, curved members, trusses, plates, and shells. Messrs. Smith and Mitchell.

E. M. 503. Introduction to Elasticity. 0-0-3

Prerequisites: E. M. 501, Math. 432.

Mathematical analysis of internal stresses in circular and rectangular plates. Problems involving symmetrical deformations, and stress concentrations. Messrs. Smith and Mitchell.

E. M. 505. Research in Strength of Materials. 3-3-3

Special problems and investigations. Graduate staff.

E. M. 506. Research in Mechanical Vibrations. 3-3-3

Special problems and investigations. Graduate staff.

E. M. 507. Research in Fluid Mechanics. 3-3-3

Special problems and investigations. Graduate staff.

E. M. 508. Advanced Fluid Mechanics. 4-0-0

Prerequisite: E. M. 430.

A study of more advanced problems than taken up in E. M. 430; resistance of immersed and floating bodies, the boundary layer theory, separation, effects of viscosity, skin friction; dynamics of compressible fluids; thermodynamics of compressible fluids; special problems in fluid mechanics. Mr. Feltner.

E. M. 510. Engineering Mechanics Seminar. 1-1-1

Reports, discussions, and preparation of papers. Graduate staff.

E. M. 511, 512. Similitude for Engineers. 4-4-0

Prerequisites: E. M. 321, E. M. 430.

The study of the use of models as aids in engineering design; principles and methods of dimensional analysis; design, construction and testing of models; interpretation of results; use of models of beams and shafts under static and dynamic loading; applications to problems of fluid flow; distorted models; application to advanced problems in mechanics of elastic solids; dissimilar models. Mr. Feltner.

ENGLISH

Freshman English

Eng. 101, 102, 103. Composition. 3-3-3

Required of all freshmen.

Grammar review and intensive practice in composition; reading and analysis of literary types, with emphasis upon both composition and appreciation; directed supplementary reading collateral with class study; exercises and reports; conferences.

Writing

Eng. 211. Business Correspondence 3 or 3 or 3

Prerequisites: Eng. 101, 102, 103.

Practical application of the principles of composition with special emphasis on the form, style, and tone of effective business correspondence; intensive word study; collateral reading; reports.

Messrs. Shelley, Dickinson, Davis, Wilson, Wynne; Mesdames Howell, Litwack, Leitch, Turner.

Eng. 215. Principles of News and Article Writing. 3-0-0

Prerequisites: Eng. 101, 102, 103. (Class limited to twenty students.)

Introduction to the writing of simple news articles; class criticism of non-technical newspaper and magazine articles. Vocabulary building; collateral reading. Mrs. Wallace.

Eng. 216. Advanced Article Writing. 0-3-0

Prerequisites: Eng. 101, 102, 103, and 215 or equivalent.

A continuation of Eng. 215, with intensive practice in writing and criticizing nontechnical articles. Subjects determined by student's interest. Vocabulary building; collateral reading. Mrs. Wallace.

Eng. 222. Advanced Composition. 3 or 3 or 3

Prerequisites: Eng. 101, 102, 103.

A course in creative writing especially designed for students who have demonstrated ability; emphasis on short prose fiction. Mr. Hartley.

Eng. 321. Technical Writing I. (For students in Engineering.) 3 or 3 or 3

Prerequisites: Eng. 101, 102, 103.

Intensive practice in writing engineering reports, articles, and papers for public delivery; readings in essays and in technical periodicals. Term papers in library research and technical-report writing.

Messrs. Fountain, Davis, Doak.

Eng. 323. Technical Writing II. (For students in Agriculture and Forestry.) 0-0-3

Prerequisites: Eng. 101, 102, 103, and required sophomore English courses.

Fundamentals of style in professional writing. Reports, articles, papers. Term papers in library research and in professional reports.

Messrs. Fountain, Davis, Doak.

Speech

Eng. 231. Public Speaking. 3 or 3 or 3

Prerequisites: Eng. 101, 102, 103.

Speech organization and effective delivery; extempore speeches; audience motivation and use of motivating process; acquisition of ease before audience. Messrs. Paget, Fountain, Swain, Wynne; Miss Griffin.

Eng. 236. Parliamentary Practice. 0-3-0

Prerequisites: Eng. 101, 102, 103.

Not to be counted toward the fulfillment of any requirement in English.

Rules and customs of assemblies, including organization, motions; participation in and conduct of meetings; parliamentary strategy.

Mr. Paget.

Eng. 237. Speech Adjustment. 0-0-3

Prerequisites: Eng. 101, 102, 103.

Poise and pleasing communicative habits in all group contacts; habits of speech, posture, action, and language. Mr. Paget.

Eng. 331. Persuasion. 3-0-0

Prerequisite: Eng. 231 or equivalent.

Psychological forces, methods of conciliation, securing and holding attention, and winning response; extempore speeches and discussions.

Mr. Paget.

Eng. 332. Argumentation and Extemporaneous Speaking. 0-3-0

Prerequisite: Eng. 231 or equivalent.

Analysis, brief-drawing and evidence, and methods of proof and refutation; fundamentals of conviction; naturalness and forcefulness; extempore speeches, debates, and discussions. Mr. Paget.

Eng. 333. Public Address. 0-0-3

Prerequisite: Eng. 231 or equivalent.

Public speaking for special occasions, including speech of introduction, committee-room speech, after-dinner speech, speech at professional convention, political speech, formal sales talk. Mr. Paget.

Eng. 334. Radio Speaking. 3 or 3 or 3

Not to be counted toward the fulfillment of any requirement in English.

Prerequisites: English 231, or equivalent; approved admittance by the instructor.

Laboratory practice in the skills of radio speech; the physical properties of voice; diction; tempo; emotion. Mr. Swain.

Literature

Eng. 261. English Literature I. 3-0-0

Prerequisites: Eng. 101, 102, 103.

Chief masterpieces of English literature from *Beowulf* through Shakespeare, with emphasis on social and historical backgrounds. Parallel readings and papers. Messrs. Hartley, Clark, Rulfs, Shelley.

Eng. 262. English Literature II. 0-3-0

Prerequisites: Eng. 101, 102, 103.

Significant prose and poetry of the seventeenth and eighteenth centuries, with emphasis on the contribution of the two centuries to modern thought. Parallel readings and papers. Messrs. Hartley, Clark, Rulfs, Shelley.

Eng. 263. English Literature III. 0-0-3

Prerequisites: Eng. 101, 102, 103.

Masterpieces of the nineteenth century, with emphasis on changing literary tastes and ideas; the impact of scientific development on thought and literature. Parallel readings and papers.

Messrs. Hartley, Clark, Rulfs, Shelley.

Eng. 265. American Literature I. 3-0-0

Prerequisites: Eng. 101, 102, 103.

A study of chief American literary productions in their historical setting, from the early colonial period to 1840.

Messrs. Ladu, Kincheloe, Walser.

Eng. 266. American Literature II. 0-3-0

Prerequisites: Eng. 101, 102, 103.

A study of chief American literary productions in their historical setting, from 1840 to 1900. Messrs. Ladu, Kincheloe, Walser.

Eng. 267. American Literature III. 0-0-3

Prerequisites: Eng. 101, 102, 103.

A study of the leading American writers of the present century, with a relation of their works to the social background of the period.

Messrs. Ladu, Kincheloe, Walser.

Eng. 271. The English Novel. (Not offered 1947-48) **3-0-0**

Prerequisites: Eng. 101, 102, 103.

Analysis of representative novels of England and America, chosen to illustrate the development of the form and to provide a background for appreciating the modern novel. **Staff.**

Eng. 272. Modern Drama **0-0-3**

Prerequisites: Eng. 101, 102, 103.

Modern plays, beginning with Ibsen; contemporary English and American productions. Mr. Clark.

Eng. 273. The Development of the Drama. (Not offered in 1947-48) **0-0-3**

Prerequisites: Eng. 101, 102, 103.

Origin, progress, and influence; plot, characterization, and interpretation of certain readings. **Staff.**

Eng. 275. Southern Writers. 3-0-0

Prerequisites: Eng. 101, 102, 103.

An introduction to Southern culture as revealed in poetry from Poe to John Crowe Ransom and in the regional novel and short story; readings in the contemporary Southern essay dealing with social, political, and literary problems. Messrs. Marshall, Kincheloe.

Eng. 276. English Poetry, 1830-1900. (Not offered in 1947-48) 0-3-0

Prerequisites: Eng. 101, 102, 103.

A study of major poets writing in an age of scientific progress and social change. Emphasis on Browning, Tennyson, and Arnold. Parallel readings and papers. **Mr. Hartley.**

Eng. 282. The Short-Story. **0-3-0**

Prerequisites: Eng. 101, 102, 103.

An appreciation of the present-day short-story through examination of development, structure, type, and style; a comprehensive term paper, or its equivalent in original short fiction. **Mr. Wynne.**

Eng. 283. The Bible as Literature. (Not offered 1947-48) 0-3-0

Prerequisites: Eng. 101, 102, 103.

Selected books of the Old and New Testaments (King James Version) as literary and historical documents. Mr. Ladu.

Eng. 285. Shakespeare. 3-0-0

Prerequisites: Eng. 101, 102, 103.

An analysis of principal plays. Reports on parallel readings. Mr. Hartley.

Eng. 286. The Romantic Period. 0-3-0

Prerequisites: Eng. 101, 102, 103.

English literature from 1790 to 1830, with special emphasis on Wordsworth, Coleridge, Byron, Shelley, and Keats; collateral reading; reports. Mr. Clark.

Eng. 287. Modern Biography. (Not offered 1947-48) 0-3-0

Prerequisites: Eng. 101, 102, 103.

A study of short modern biographies by representative American and British writers; collateral reading in longer biographical works; reports and assignments for investigation. Staff.

Eng. 291. The Eighteenth Century. (Not offered 1947-48) 0-3-0

Prerequisites: Eng. 101, 102, 103.

Chief masterpieces of English literature from Alexander Pope to Robert Burns; collateral reading; reports. Mr. Hartley.

Eng. 292. Contemporary British Literature. 0-3-0

Prerequisites: Eng. 101, 102, 103.

An introduction to chief figures in contemporary British literature. Collateral readings; term paper. Mr. Ladu.

Eng. 295. World Literature I. 3-0-0

Eng. 296. World Literature II. 0-3-0

Eng. 297. World Literature III. 0-0-3

Prerequisites: Eng. 101, 102, 103.

A year's course in the chief masterpieces of world literature especially adapted for students in the School of Engineering who have chosen the sequence in the humanities. The course will introduce the student to the great plays, novels, and poems that have delighted and enlightened mankind from the great era of Greek literature to the present day and will place emphasis on the ideas that provide a background for contemporary thought.

ETHICS AND RELIGION

Courses

Ethics 201, 202, 203. Effective Living. 3-3-3

An integrative study of personality organization, premarital and post-marital adjustment, and basic ethical and philosophical issues of today, to the end that the individual may formulate a substantial personal philosophy of life as the foundation for useful career. Mr. Hicks.

Rel. 301. Introduction to Religion. 3-0-0

Characteristics of the major religious sects of America and brief survey of recent trends in religious thought. Mr. Hicks.

Rel. 302. The Life of Jesus. 3-0-0

The career of Jesus of Nazareth as recorded in the Synoptic Gospels and interpreted against the religious, economic, and political background of the age in which Jesus lived. Mr. Hicks.

Rel. 303. The Teachings of Jesus. 0-3-0

The ethical and religious teachings of Jesus as recorded in the Synoptic Gospels, with special emphasis on the contrast between the teachings of Jesus and his contemporaries. Mr. Hicks.

Rel. 304. Comparative Religion. 0-3-0

Brief history, general characteristics, and social significance of living religions of the world. Mr. Hicks.

Rel. 305. Religious Education. 3 credits

Prerequisite: Approval of Instructor.

Survey of the contemporary educational organization and practice of the major denominations in the United States. Lectures, personal conferences and field assignments. Mr. Hicks.

Ethics 405. Social Ethics. 0-0-3

Prerequisite: Six term credits in Religion or related fields.

Review of the ethical codes of the larger professional groups, with analysis of the nature, evolution, and significance of moral values. Mr. Hicks.

Rel. 406. Problems of Religion. 0-0-3

Prerequisite: Six term credits in Religion or related fields.

Religious verities in an age of science and the problems of the church in modern times. Mr. Hicks.

Ethics 407. Ethical Problems of Adolescence. 3 credits

Prerequisite: Six term credits in Religion or related fields.

Typical adjustment problems of modern youth, with special consideration to adolescent and pre-adolescent sex instruction and guidance.

Mr. Hicks.

Rel. 408. Christian Personality in Its Psychological Aspects. 3 credits

Prerequisite: Six term credits in Religion or related fields.

An analysis of the psychological validity of the principal ethical teachings of the Sermon on the Mount with emphasis on the relationship of religious attitudes and practices to mental and emotional stability and maturity.

Mr. Hicks.

Ethics 409. Marriage and Family Living. 3 or 3 or 3

Prerequisite: Six term credits in biological or social science. Sections limited to 25 students.

The practical application of pertinent findings of biological and social science to personal problems of premarriage and postmarriage adjustment. Lectures, discussions, and personal conferences. Mr. Hicks.

FIELD CROPS (AGRONOMY)

Courses for Undergraduates

F. C. 101. General Field Crops. 4-0-0 or 0-4-0

A standard introductory course dealing with fundamental factors in production and management of crops. Mr. Klingman.

F. C. 301. Crop Production I: Food and Feed Crops. 4-0-0

Prerequisites: F. C. 101 and Soils 202.

The content of this course is built around the agriculture of this general region and North Carolina in particular. Crop adaptation, and the place of individual crops in different cropping systems is discussed. Special attention is given to production problems with corn, the small grains and the important legume crops grown in this area for their seed. Staff.

F. C. 402. Crop Production II: Tobacco and Cotton. 0-4-0

Prerequisites: F. C. 101 and Soils 202.

A study of tobacco and of cotton production from the standpoints of Botany and growth characteristics, seeding practices, cropping systems, mineral nutrition, field care, varieties, harvesting, processing, elements of quality and factors influencing quality, and uses of the crop.

Messrs. Colwell, Kerr.

F. C. 403. Pastures and Forage Crops. 0-0-4

Prerequisites: F. C. 101 and Soils 202.

A study of the production and preservation of the principal forage crops. Special attention is given to the development and maintenance of pastures. Mr. Lovvorn.

F. C. 412. Plant Breeding. 0-3-0

Prerequisite: Zool. 411.

Lectures, field and laboratory exercises, including methods and principles of plant breeding. Mr. Gregory.

F. C. 413. Weeds and Their Control. 0-0-2

Physiological principles involved in cultural and chemical control. Practice in identification of plants and seeds. Mr. Klingman.

F. C. 421, 422, 423. Special Problems. 3-3-3

Prerequisite: Admitted only with consent of instructor.

Special problems in various phases of crop investigation. Problems may be selected or will be assigned. Emphasis will be placed on review of recent and current research. Staff.

Courses for Graduates Only

F. C. 503. Advanced Plant Breeding and Plant Genetics. 0-0-3

Prerequisites. Good foundation in genetics, cytogenetics, plant morphology and evolution.

Theory, procedure and technique. Mr. Gregory.

F. C. 513. Forage Crop Ecology. 0-3-0

Prerequisites: F. C. 403 and Botany 441.

Research methods and consideration of the literature. Mr. Lovvorn.

F. C. 515. Research Methods in Plant Science. 0-3-0

Prerequisite: Stat. 412.

See Stat. 515 for description. Mr. Rigney.

F. C. 522, 523. Cytogenetics. 0-5-5

Prerequisites: Elementary microtechnique; foundation in genetics, plant morphology and evolution.

Principles of cytology, cytogenetics, in theory and practice. Mr. Smith.

F. C. 531. Seminar. One credit per term

Prerequisite: Graduate standing in Field Crops.

Scientific articles, progress reports in research, and special problems of interest to agronomists reviewed and discussed. Staff.

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate.

F. C. 541. Research. Credits by arrangement.

Prerequisite: Graduate standing in Field Crops. Staff.

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate.

FORESTRY

Courses for Undergraduates

For. 101. Elementary Forestry. 3-0-0

The nature and development of forests of the world, with special study of the forests of the United States; a correlation of all sciences required in forestry; field trips included. Messrs. Miller, Chalfant.

For. 111. Principles of Farm Forestry. 3 or 3-0

The theory and practice of forestry with special reference to the handling of farm woodlands and the utilization of their products; the place of forestry in farm management and the agricultural economy.

Mr. Chalfant.

For. 201. Wood Technology. 3 or 3-0

Microscopic slides of the conifers and broad-leaved trees are studied in order to determine the occurrence, form, and structure of the wood elements. Identification by means of the hand lens is especially emphasized.

Mr. Slocum.

For. s204. Silviculture. 3 credits

Sophomore summer camp.

Growth and development of forest stands; reproduction counts, type mapping, thinning and weeding; establishment and measurement of sample plots. Messrs. Miller, Slocum.

For. s214. Dendrology. 2 credits.

Prerequisites: Bot. 211.

Sophomore summer camp.

Identification and study of trees in Piedmont and Mountain sections of North Carolina. Messrs. Slocum, Miller.

For. s244. Forest Protection, Improvements, and Influences I. 2 credits.

Sophomore summer camp.

Forest fire prevention and control methods. Road and improvement construction and effect of weather on fire conditions. Mr. Chalfant.

For. s274. Mensuration I. 2 credits

Sophomore summer camp.

Collection of field data for stand and yield tables, stem analysis, and timber surveys. Messrs. Slocum, Miller.

For. 301. Timber Preservation. 0-3-0

Prerequisite: For. 201.

Lumber and timber preservatives and their use; methods of preservation; relation of preservation to forestry and industry. Mr. Slocum.

For. 311. Forest Utilization I. 3-0-0

Prerequisite: Chem. 203.

The problems of more complete utilization of forest resources; utilization of present waste in commercial practice. Mr. Wyman.

For. 313. Forest Utilization II. 0-0-3

A continuation of Forest Utilization I in the field with visits to and reports on wood utilization plants. Mr. Wyman.

For. 321. Lumber Seasoning and Grading. 3-0-0

Prerequisite: For. 201.

Air-seasoning and kiln-drying of lumber; kiln construction and operation; lumber grading principles. Mr. Wyman.

For. 322. Gluing and Plywood. 0-3-0

Prerequisite: For. 201.

Methods of manufacturing veneer and assembling plywood. Properties and uses of glues and resins in plywood and built-up woods. Mr. Wyman.

For. 323. Logging. 0-0-3

The logging industry and transportation methods; logging costs; application of methods to specific conditions; all forest regions are covered, discussing the problems of each. Mr. Wyman.

For. 331. Naval Stores. 3-0-0

Prerequisite: Chem. 203.

Methods of turpentining woods practices; factors influencing oleoresin yields; distilling practices; integration with other forest products utilization. Mr. Wyman.

For. 332. Forest Policy. 0-3-0

State and federal forest legislation; timber law, illustrated by court cases. Mr. Miller.

For. 343. Forest Protection, Improvements, and Influences II. 0-0-3

Prerequisite: For. s244.

Organization and operation of forest fire prevention and control methods. Forest road and telephone line construction and maintenance. Effect of weather on fire conditions. Mr. Chalfant.

For. 353. Dendrology. 0-0-1

Identification and study of trees in the Coastal section of North Carolina. Mr. Slocum.

For. 361. Silviculture I. 3-0-0

Prerequisite: Bot. 211 or For. s204.

Factors affecting tree growth and distribution; forest regions, sites, stands, and types; silvical requirements of important tree species. Mr. Miller.

For. 362. Silviculture II. 0-3-0

Production, collection, extraction, storage, and planting of forest-tree seeds. Mr. Slocum.

For. 363. Silviculture III. **0-0-3**

Prerequisite: For. 361.

Methods of cutting to secure natural regeneration; intermediate cuttings, and their effect on the stand; slash disposal. Mr. Miller.

For. 371, 373. Mensuration II, III. **3-0-4**

Prerequisite: For. s274.

The measurement of timber, both standing and felled; log rules, form factors, stem analysis, and growth.

Methods of making volume, growth, and stand tables; increment and yield studies; development of stand and yield tables from field data. Mr. Slocum.

Courses for Graduates and Advanced Undergraduates

For. 401. Forest Finance. **3-0-0**

Forests as investments: interest, carrying charges, financial maturity; relation of intermediate to final and net incomes; forest taxation, hazards in forest investments, and forest insurance. Mr. Chalfant.

For. 403. Timber Appraisal. **0-3-0**

Field and office methods of valuing timber lands, with special reference to stumpage appraisal; the evaluation of damages to timber and forest property. Mr. Chalfant.

For. 411. Silviculture IV. **3-0-0**

Prerequisite: For. 363.

The application of silvicultural methods in the forests of the United States. Mr. Miller.

For. 422. Forest Products. **0-3-0**

Prerequisite: For. 201.

The source and method of obtaining derived and manufactured forest products other than lumber. Mr. Wyman.

For. 431, 432. Forest Management. **3-3-0**

Prerequisite: For. 371.

Management of timber lands for economic returns; the normal forest taken as the ideal; the application of regulation methods to the forest; a typical working circle as developed by the United States Forest Service studied for each forest region. Mr. Hofmann.

For. 433. Advanced Wood Technology. 0-3-0

Prerequisite: For. 201.

Advanced microscopic identification of the commercial woods of the United States; microscopic work in anatomy and identification. Mr. Slocum.

For. 442. Lumber Manufacturing. 0-3-0

The manufacture and re-manufacture, transportation and handling of lumber; grades and grading of lumber. Mr. Wyman.

For. 452. Forest Grazing. 0-0-3

Management of range areas, all grazing regions with special consideration of the southeast. Mr. Kaufman.

For. 453. Aerial Mapping. 0-0-2

Interpretation of aerial photographs, determination of density of timber stands and area mapping. Mr. Chalfant.

For. 461, 462, 463. Forestry Problems. 3-3-3

Assigned or selected problems in the field of silviculture, logging, lumber manufacturing, or forest management. Staff.

For. 473. Methods of Research in Forestry. 0-0-3

Methods and procedures, problem outlines, presentation of results; consideration of selected studies by forest research organizations; sample plot technique. Mr. Kaufman.

Courses for Graduates Only

For. 501, 502, 503. Advanced Forest Management Problems. 3-3-3

Complete management program for a specific forest area. Mr. Hofmann.

For. 511, 512, 513. Advanced Silviculture Problems. 3-3-3

Advanced problems or experiments in silviculture. Mr. Miller.

For. 521, 522, 523. Advanced Logging Problems. 3-3-3

Selected research logging problems of an advanced nature. Mr. Wyman.

For. 531, 532, 533. Advanced Lumber Manufacturing. 3-3-3

Selected advanced problems dealing with the manufacture and seasoning of lumber. Mr. Wyman.

For. 541, 542, 543. Advanced Utilization Problems. 3-3-3

Problems of an advanced grade in some phase of forest utilization.
Mr. Wyman.

For. 551, 552, 553. Forest Valuation. 3-3-3

Planning, organizing, and conducting, under general supervision, an important research project in one of the fields of valuation. Mr. Wyman.

For. 561, 562, 563. Problems in Research. 3-3-3

Specific forestry problems that will furnish material for a thesis.
Mr. Miller.

GEOGRAPHY

Courses for Undergraduates

Geog. 201,2. Geography. 3-3-0

Elective.

A course covering the principal elements of physical and human geography. Mr. Shulenberger.

GEOLOGY

Courses for Undergraduates

Geol. 101. Earth History. 0-3-0

Elective. Not to be taken after Geol. 120, and 222.

Introductory course in General Geology: changes in the earth, and underlying physical and life processes. Mr. Stuckey.

Geol. 120. Physical Geology 4 or 4 or 4

Required of freshmen in Basic Agriculture and Agricultural Education, and of sophomores in Forestry, Landscape Architecture and specialized curriculum in Agriculture, and in Ceramic, Civil, and Geological Engineering.

Dynamic processes acting on and within the earth; materials and make-up of the earth's crust; emphasis on engineering and agricultural applications in the southeast. Lectures, laboratories, and field trips.
Staff.

Geol. 207. Ex. Physical Geography. 3-3-0

A. The processes and forces involved in the development of land forms.

B. The physiographic provinces of the United States and their importance; physical geography of North Carolina. Mr. Stuckey.

Geol. 222. Historical Geology. 0-3-0

Prerequisite: Geol. 120.

Required of sophomores in Geological Engineering.

Major events in the history of North America; rise and development of main animal and plant groups. Lectures, laboratories and field trips.

Mr. Holt.

Geol. 230. Mineralogy. 3-0 or 3

Prerequisite: Chem. 103.

Required of sophomores in Ceramic and Geological Engineering.

Crystallography, and physical and chemical mineralogy. Lectures and laboratory work. Messrs. Stuckey, Miller.

Geol. 315. 316. General Engineering Geology 3-3-0 or 0-3-3

Prerequisite: Junior standing.

Required of juniors in Engineering-General curriculum.

General study of geologic processes; materials and structures of the earth's crust. Applications of geological information to engineering works; occurrence and use of mineral deposits important to engineers.

Special course will not be offered after June 1949. Staff.

Geol. 325. Geology and Mineral Resources of North Carolina. 3-0-0

Prerequisite: Geol. 222.

Physical geography, general geology, common rocks and minerals, and mines and quarry products of the State. Lectures, laboratories, and field trips. Mr. Stuckey.

Geol. 332. Advanced Mineralogy. 0-2-0

Prerequisite: Geol. 230. Required in Geological Engineering.

A continuation of Geol. 230. Special attention to chemical and blowpipe properties of a larger group of important minerals. Lectures and laboratory work. Messrs. Stuckey, Miller.

Geol. 351. Structural Geology. 4-0-0

Prerequisite: Geol. 120.

Required in Geological Engineering.

The arrangement and deformation of the different rock masses composing the earth's crust. Lectures, laboratories and field trips. Mr. Parker.

Courses for Graduates and Advanced Undergraduates

Geol. 412, 413. Economic Geology. 0-4-4

Prerequisites: Geol. 120 and 230; Chem. 103.

Required of seniors in Geological Engineering.

Mode of occurrence, association, origin, distribution, and uses of economically valuable minerals. Lectures, laboratories, and field trips.

Mr. Stuckey.

Geol. 431, 432, 433. Optical Mineralogy. 3-3-3

Prerequisites: Geol. 230 and Phys. 203.

Required of seniors in Geological Engineering and in fifth year of Ceramic Engineering.

Optical principles involved in the petrographic (polarizing) microscope and related instruments. Microscopic determination of minerals in thin section and in fragments. Lectures and laboratory work.

Messrs. Stuckey, Parker.

Geol. 443. Petrology. 0-0-4

Prerequisites: Geol. 120 and 230; Chem. 103.

Required of juniors in Geological Engineering.

Materials of the earth's crust; composition, texture, classification, megascopic identification, and alterations of the principal igneous, sedimentary, and metamorphic rocks. Lectures, laboratories, and field trips.

Mr. Parker.

Geol. 462. Engineering Geology. 0-3-0

Prerequisite: Geol. 120.

Required of seniors in Geological Engineering.

The application of geologic principles to engineering practice; analysis of geologic factors and processes affecting specific engineering projects.

Mr. Miller.

Geol. 463. Geological Surveying. 0-0-4

Prerequisites: Geol. 351 and 443.

Required of seniors in Geological Engineering.

Methods of field observation and use of geologic surveying instruments in surface and underground work; representation of geologic features by maps, sections and diagrams. Lectures, laboratories, and field work.

Messrs. Parker, Miller.

Geol. 470. Mining Methods. 4-0-0

Prerequisites: Geol. 351 and 443.

Required of seniors in Geological Engineering.

Introduction to mining; study of the various methods of exploitation of rock and mineral deposits and bases for choice of any particular method from both the geologic and the economic standpoint. Mr. Miller.

Geol. 471, 472, 473. Mining and Mineral Dressing. 3-3-3
Prerequisite: Geol. 470.
Required in fifth year of Geological Engineering.
Principles of the mineral industry; mining laws, prospecting, sampling, developments, drilling, blasting, handling, ventilation and safety; administration, surveying, assaying; preparation dressing and marketing.
Mr. Miller.

Geol. 480. Geomorphology. 3-0-0
Prerequisite: Geol. 443.
Required in fifth year of Geological Engineering.
A systematic study of land forms and their relations to processes and stages of development and adjustment to underlying structure. Lectures, map interpretations, and field trips. Mr. Stuckey.

Courses for Graduates Only

Geol. 511, 512. Advanced Economic Geology. 3-3-0
Prerequisites: Geol. 412, 413.
Detailed study of the origin and occurrence of specific mineral deposits.
Mr. Stuckey.

Geol. 515. Petroleum Geology. 0-0-3
Prerequisite: Geol. 522.
Required in fifth year of Geological Engineering.
Properties, origin and modes of occurrance of petroleum and natural gas. Geologic and economic features of the principal oil and gas fields, mainly in the United States. Messrs. Stuckey, Parker.

Geol. 522. Stratigraphy and Index Fossils. 0-3-0
Prerequisite: Geol. 551.
Required in fifth year of Geological Engineering.
Character, distribution, sequence, correlation and conditions of origin of the major sedimentary formations in the southeastern U. S. Key fossils characteristic of each period. Lectures, laboratories and field trips.
Mr. Holt.

Geol. 533. Microscopic Determination of Opaque Minerals 0-0-3
Prerequisites: Geol. 332 and 433.
Required in fifth year of Geological Engineering.
Identification of metallic, opeaque minerals in polished sections by physical properties, etch reactions and microchemical tests. Laboratories.
Messrs. Stuckey, Parker.

Geol. 543. Advanced Petrography. 0-0-3

Prerequisites: Geol. 433, 443.

Application of the petrographic microscope to the systematic study of the composition and origin of rocks; emphasis on igneous and metamorphic rocks. Messrs. Stuckey, Parker.

Geol. 551. Sedimentation. 3-0-0

Prerequisite: Geol. 443.

Required in fifth year of Geological Engineering.

Formation of sediments and sedimentary rocks, including their kinds, structures, sources, transportation, mode and environment of deposition. Mr. Parker.

Geol. 553, 554. Geophysics. 0-3-3

Prerequisites: Geol. 351, Phys. 203, and C. E.

Required in fifth year of Geological Engineering.

Discussion of the fundamental principles underlying all geophysical methods; procedure and instruments involved in gravitational, magnetic, seismic, electrical and other methods of studying geological structures and conditions; study of applications and interpretations of results. Mr. Miller.

Geol. 581, 582, 583. Seminar. 1-1-1

Prerequisite: Graduate standing.

Scientific articles, progress reports and special problems of interest to geologists and geological engineers discussed. Staff.

Geol. 591, 592, 593. Geological Research. 3-3-3

Prerequisite: Permission of the Instructor.

Lectures, reading assignments, and reports; special work in Geology to meet the needs and interests of the students. Staff.

HISTORY AND POLITICAL SCIENCE

Courses in History

Hist. 101, 102, 103. Economic History. 3-3-3

Required of sophomores in Industrial Education, Industrial Arts Education, and Textiles.

A survey of the development of economic life in the United States. Staff.

Hist. 111, 112, 113. World History. 2-2-2

A general survey of Western civilization from its beginning to the present day. Mr. Barnhardt.

Hist. 121, 122. United States History. 3-3-0

Required of all freshmen in the School of Agriculture except those in Forestry; also required of freshmen in Agricultural Education.

A survey of the history of the United States since 1789, emphasizing both political and social development. Staff.

Hist. 211, 212, 213. History of the United States. 3-3-3

Elective for one, two, or three terms.

A chronological treatment of the political, diplomatic, and constitutional history of the United States in the light of its economic and social significance. Mr. Brown.

Hist. Ex. 216. Medieval History. 3 credits

A survey of the political, social, economic, ecclesiastical, and cultural history of Europe from the fourth century to the close of the fifteenth century. Mr. Barnhardt.

Hist. 221. History of Modern Europe. 3-0-0

Elective.

A survey of the economic, political, and social developments in Europe from the age of the great discoveries to the close of the eighteenth century. Mr. Barnhardt.

Hist. 222. History of Modern Europe. 0-3-0

Elective.

A survey of European history during the nineteenth century, political, economic, and social movements being emphasized in proportion to their international or European importance. Mr. Barnhardt.

Hist. 223. Contemporary Europe. 0-0-3

Elective.

A survey of the contemporary history of the principal European states and their international relations in the twentieth century. Mr. Barnhardt.

Hist. 306. North Carolina History. **0-3-0**

Elective.

A general survey of the political, social, economic, and cultural developments in North Carolina, with special emphasis on the nineteenth and twentieth centuries. Mr. Barnhardt.

Hist. Ex. 310, 311, 312. Economic and Social History of the South. **9 credits**

A study of the economic and social history of the Southern States. Lectures, readings, and reports. Mr. Noblin.

Hist. Ex. 320. American Biography. **3 credits**

Representative men and women in American politics, law, religion, agriculture, industry, commerce, science, literature, and art. Mr. Barnhardt.

Hist. 333. History of American Agriculture. **0-0-3**

Main trends in agriculture in the United States, and the place of agriculture in the economic life of the nation; special emphasis on the period since the Civil War. Mr. Seegers.

Hist. 340. History of Modern England. **3 credits**

Survey of English political, social, economic, and diplomatic history, with emphasis on the nineteenth and twentieth centuries. Mr. Barnhardt.

Hist. Ex. 350. Hispanic American History. **3 credits**

A brief account of the colonial period and wars for indpendence, followed by more or less detailed study of the various Hispanic American republics, with emphasis upon their relations with the United States. Mr. Brown.

Hist. Ex. 360. Contemporary History of the United States. **3 credits**

Significant developments in the United States since 1914, with particular emphasis on post-war problems, foreign affairs, and the New Deal.

Mr. Raab.

COURSES IN POLITICAL SCIENCE

Pol. Sc. 211. American Government. 3 or 3 or 3

Required of all freshmen in Agriculture and in Agricultural Education.

A survey of the origins, structure, and functions of the government of the United States. Staff.

Pol. Sc. 212. State Government and Administration. 0-3-0

A study of Federal-State relations, and the organization and administration of state and county governments. Special attention will be given to problems of government in North Carolina. Mr. Edsall.

Pol. Sc. 213. Municipal Government and Administration. 0-0-3

A study of the history, organization, and administration of American municipal corporations. Lectures, readings, and reports. Mr. Edsall.

Pol. Sc. 221. American Political Parties. 3-0-0

Elective.

The origin and development of political parties in the United States: their functions, organization, regulation, campaign methods, and elections. Mr. Edsall.

Pol. Sc. 231. European Governments. 3-0 or 3

Elective.

A study of the governments of England, France, Germany, Italy, and Russia. Mr. Barnhardt.

HORTICULTURE

Courses for Undergraduates

Hort. 101. General Horticulture. 4 or 0 or 4

A course designed to give a general insight into the field of horticulture, including geographic centers of production, and the elements of culture of fruit, vegetable, and floral crops. Messrs. Schmidt, Randall, Francis.

Hort. 201, 202, 203. Woody Plants. 2-2-2

Prerequisite: Bot. 203.

Required of sophomores in Landscape Architecture and juniors in Floriculture; elective for students in other curricula.

Trees, shrubs, and vines: their distribution, form and habits of growth, size, texture, color, and other characteristics determining use in planting design. Mr. Randall.

Hort. 213. Herbaceous Plants. **0-0-2**

Required of juniors in Landscape Architecture; elective for students in other curricula. Prerequisite: Bot. 203.

Ornamental perennial and annual plants: height, habit of growth, texture, color, and other characteristics determining use in planting design.

Mr. Randall.

Hort. 301. Plant Propagation. **3 or 3 or 3**

Study of principles, methods and practice in seedage, cuttage, division, budding, and grafting. A field trip is required. Mr. Randall.

Hort. 303. Vegetable Growing. **0-0-3**

Prerequisite: Hort. 101.

Soil preparation, fertilization, irrigation, and general culture of vegetable crops. Mr. Schmidt.

Hort. 311. Nursery Practice. **3-0-0**

Prerequisites: Hort. 101 and 301.

A course designed to acquaint the student with the principles and practices involved in the production, management, and marketing of nursery plants. Attention will be given to nursery grades for fruits and ornamentals, and inspection laws, and a field trip is required. Mr. Randall.

Hort. 312. Floral Design and Shop Management. **0-2-0**

Principles and practices in the art of floral design, including the making of corsages, wreaths, sprays, and special arrangements; principles of shop management. A special fee not to exceed $10.00 is required of students taking this course to pay part of the cost of buying flowers and other materials needed. Mr. Randall.

Hort. 313. Flower Growing. **0-0-3**

Prerequisite: Hort. 101.

Principles and methods of growing outdoor floral crops and house plants, including varieties and their adaptability. A field trip is required.

Mr. Randall.

Hort. 321. Grading, Packing and Judging Horticultural Crops. **2-0-0**

Prerequisite: Hort. 101.

Variety identification, grading, packing, exhibiting, and judging horticultural crops. Grades and standards. Messrs. Schmidt, Randall, Francis.

Hort. 323. Ornamental Horticulture. 0-0-2

Prerequisites: Hort. 301 and Hort. 402.

The planting, transplanting, pruning, feeding, and protection of ornamental plants used in the construction and maintenance of rural home grounds. Lawn grasses and lawn-making. Mr. Harris.

Hort. 331. Fruit Growing. 3-0-0

Prerequisite: Hort. 101.

Establishing the orchard, sites, varieties, cultural practices, pruning and training, spraying, harvesting, marketing and storage. A field trip is required. Mr. Francis.

Hort. 341. Fruit and Vegetable Processing. 3-0-0

Principles and methods involved in the processing and utilization of horticultural crops; including extraction and preservation of juices, quick-freezing, and other methods concerned with the manufacture of fruit and vegetable products. Mr. Jones.

Courses for Graduates and Advanced Undergraduates

Hort. 402. Ornamental Plants. 0-2-0

Prerequisite: Bot. 203.

Required of seniors in Vegetable Gardening and Pomology; elective for juniors or seniors in other curricula.

Ornamental trees, shrubs, and vines: their characteristics used in the design of planting for home, school, church, and community-center grounds, and farmstead landscapes. Mr. Randall.

Hort. 403, 411, 412, 413. Horticultural Problems I and II. 0-0-1 and 2-2-2

Prerequisite: Twelve credit hours in horticulture.

This is one continuous course through four quarters which consists of a systematic investigation of some phase of horticulture, each student choosing his own subject of study and pursuing it under direction of the instructor. Staff.

Hort. 421, 422. Commercial Fruit Growing. 3-0-3

Prerequisite: Hort. 331.

Factors underlying the commercial production of tree fruits, small fruits and grapes. The first term will be devoted to tree fruits and the third to small fruits and grapes. A field trip is required.

Messrs. Gardner, Morrow, Veerhoff, Williams.

Hort. 431,432, 433. Commercial Vegetable Growing. 3-3-3

Prerequisite: Hort. 303.

The production of vegetable crops commonly grown on a commercial scale, including soil and climatic adaptation, and general cultural practices. The second term will be devoted to the forcing of vegetable crops in the greenhouse and other plant growing structures. Field trips are required.

Mr. Schmidt.

Hort. 441, 442. Commercial Flower Growing. 3-3-0

Prerequisite: Hort. 313.

A study of the commercial production of the principal floral crops in the greenhouse and in other plant-growing structures, including soil preparation, planting, fertilization, and general cultural methods. Field trips are required. Mr. Randall.

Hort. 451. Systematic Pomology. (Offered in alternate years.) 2-0-0

Prerequisite: Hort. 331.

Fruit varieties: their description, identification, nomenclature, and classification; their relationships and adaptations. Mr. Gardner.

Hort. 461, 462. Technology of Fruit and Vegetable Products 3-3-0

Prerequisite: Botany 312.

The course will consist of lectures, reports, and laboratory experiments in fruit and vegetable preservation; small plant scale operations and preservation by canning, freezing, dehydration, pickling, and the manufacture of other products including juicies, purees, jams, and jellies. Mr. Jones.

Hort. 471. Systematic Olericulture. (Offered in alternate years.) 0-0-2

Prerequisite: Hort. 303.

Vegetable varieties: their description, identification, nomenclature, and classification; their relationships and adaptations. Mr. Randall.

Hort. 481. Systematic Floriculture. (Offered in alternate years.) 2-0-0

Prerequisite: Hort. 313.

Flower varieties: their description, identification, nomenclature, and classification; their relationships and adaptations. Mr. Randall.

Hort. 501, 502, 503. Advanced Horticultural Crops. 3-3-3

Prerequisite: Graduate standing in Horticulture.

Special emphasis will be placed upon experimental data and the application of these results. On an option basis the subjects are as follows: 501 fruits; 502 vegetables; 503 floral crops. Staff.

Hort. 511. Methods in Horticultural Research. **3-0-0**

Prerequisite: Graduate standing in Horticulture.

A study of methods and procedure, outlining problems, assembling and analyzing data, and presenting results; critical review of research work. **Staff.**

Hort. 521, 522, 523. Research.

Prerequisite: Graduate standing in Horticulture.

Graduate students will be required to select problems for original research in fruit growing, vegetable growing, or floriculture. The work and presentation of results should be of such merit as to be worthy of publication. **Staff.**

Hort. 531, 532, 533. Seminar. **1-1-1**

Assignment of scientific articles of interest to horticulturists for review and discussion. **Staff.**

INDUSTRIAL ENGINEERING

Courses for Undergraduates

I. E. 204. Survey of Engineering and Industrial Processes. 0-3-0

Prerequisite: Econ. 201.

Required of sophomores in Industrial Recreation.

Job-shop and mass production methods, including uses of jigs and fixtures; general descriptive features, uses, and safety features of machine tools: brief outline of time and motion techniques as applied to large-scale manufacturing operations. **Staff.**

I. E. 206, 207. Industrial Organization and Management. 3-3-0

Prerequisite: Sophomore standing.

Required of sophomores in I. E.

Organization types, advantages and disadvantages for industrial enterprise; principles of organization structure for internal control; introduction to industrial management principles; selected problems illustrating various management functions.

I. E. 328. Manufacturing Processes. 3-0-0

Prerequisite: M. E. 229.

Required of juniors in I. E.

Study of production methods; Description and evaluation of machine tools, jigs, and fixtures in modern production; Gages and special tools.

I. E. 332. Time and Motion Analysis. **0-3-0**
Prerequisite: Junior standing.
Required of juniors in I. E.
Principles and techniques in time and motion study; stopwatch and micro-motion analysis of industrial operations; work simplification and development of production standards; applications in procedures analysis.

I. E. 336. Time and Motion Laboratory. **0-1-0**
Co-requisite: I. E. 332.
Required of juniors in I. E.
Laboratory problems correlated to I. E. 332.

I. E. 343. Plant Layout and Design. **0-0-3**
Prerequisite: I. E. 328.
Required of juniors in I. E.
Problems in industrial plant design; building structures, equipment location, space utilization, layout for operation and control; allied topics in power utilization, light, heat, ventilation, and safety.

I. E. 349. Plant Layout Laboratory. **0-0-1**
Co-requisite: I. E. 343.
Required of juniors in I. E.
Laboratory problems in application of principles developed in I. E. 328 and I. E. 343.

I. E. 371, 372, 373. Principles of Industrial Engineering. **2-2-2**
Prerequisite: Econ. 203.
Survey of industrial engineering principles; organization of plant facilities and personnel for production; techniques of work simplification; time study, motion analysis; and related topics.
Special course will not be offered after June 1949.

I. E. 408, 409. Production Control. **0-3-3**
Prerequisite: I. E. 332.
Required of seniors in I. E.
Planning, scheduling, routing, and dispatching in manufacturing operations; production control systems; mechanisms for production control. Class projects will include organization of a complete production control system starting with a parts analysis from the working drawings of a production item.

I. E. 421, 422, 423. Manufacturing Costs. **3-3-3**
Prerequisite: I. E. 332, Econ. 212.
Required of Seniors in I. E.
Determination of standard costs, and distribution of overhead and prime costs; analysis of costs for comparison, replacement, depreciation, and valuation; budget considerations and records control; human engineering.

I. E. 431, 432, 433. Industrial Personnel Problems. 3-3-3

Prerequisite: Senior Standing.

Required of Seniors in I. E.

Brief history of unionism in the United States and the development of labor relations; Modern Labor relations under federal legislation; management functions in collective bargaining; techniques in job analysis, specification and standardization; wage and salary systems, including incentive plans; industrial hazards and their prevention.

I. E. 442. Advanced Time and Motion Study. 0 or 3 or 3

Prerequisite: I. E. 322.

Advanced time and motion study methods; use of synthetic time values; time-study rating techniques; analysis of principles of motion economy; survey of experimental data.

I. E. 451, 452, 453. Seminar. **1-1-1**

Prerequisite: Senior standing.

Required of seniors in I. E.

Current problems of interest to industrial engineers.

Courses for Graduates

I. E. 501, 502. Management Engineering. 3-3-0

Prerequisite: Graduate standing.

Principles of top-management planning including forecasting and preplanning considerations; detailed planning for new production; organizational planning to achieve manufacturing objectives.

I. E. 511, 512. Budgeting. 3-3-0

Prerequisite: Graduate standing and permission of instructor.

Principles of budgeting for industrial enterprises; utilization of budgets for management control and coordination; applications in various types of budgets.

I. E. 522, 523. Production Engineering. 0-3-3

Prerequisites: I. E. 502, and I. E. 512, or concurrent registration in these courses.

Technical aspects of planning for production; the Production Planning Group; methods analysis for work simplification; selection and utilization of tools and equipment for efficient production; standardization of materials and processes.

I. E. 533. Management of Employee Relations. 0-0-3

Prerequisite: Permission of Instructor.

Techniques and practices for collective bargaining negotiations; construction of collective bargaining agreements; discussions of the various interests involved in collective bargaining.

I. E. 541, 543. Government Regulation of Industrial Enterprise. 3-0-3

Prerequisite: Permission of Instructor.

Government regulation of industrial activity; Basis of regulation and rights and duties of management under such regulation; procedure before governmental bodies.

I. E. 571, 572, 573. Seminar. 1-1-1

Prerequisite: Graduate Standing.

Advanced problems in Industrial Engineering.

I. E. 581, 582, 583. Project work. 1-1-1

Prerequisite: Graduate standing.

Research and investigation for students enrolled in the fifth-year curriculum in Industrial Engineering.

I. E. 591, 592, 593. Industrial Engineering Research. 3-3-3

LANDSCAPE ARCHITECTURE

Courses for Undergraduates

L. A. 101, 102, 103. Arboriculture. 1-1-1

Required of freshmen in Landscape Architecture; elective for other students in Agriculture.

Culture of plant materials: their planting, transplanting, training, fertilization, protection from pests; tree surgery, lawn making.

Mr. Schmidt.

Courses for Advanced Undergraduates

L. A. 212, 213. Theory of Landscape Design. 0-3-3

Required of sophomores in Landscape Architecture; elective for students in other curricula.

Introduction to the study of landscape design; its theoretical basis; the meaning of taste; historic styles; elements, and landscape composition; planting design, and analyses of typical problems in landscape design.

Mr. Thurlow.

L. A. 311, 312. History of Landscape Design. 3-3-0

Prerequisites: L. A. 212, 213.

Required of juniors in Landscape Architecture.

History of the art of landscape design from antiquity to modern times; sketching from illustrations of design in important periods. Mr. Williams.

L. A. 321, 322, 323. Landscape Design I. 4-4-4

Prerequisites: L. A. 311, 312.

Required of juniors in Landscape Architecture.

Problems in presentation and elements of landscape design related to gardens, small properties, suburban estates and special areas.

Messrs. Thurlow, Enersen.

L. A. 403. Landscape Gardening. 0-0-3

Prerequisites: Hort. 402, or Hort. 201, 202, 203.

Landscape planning and planting design applied to the improvement of home, school, church, community-center grounds, and farmsteads; practice in methods of making measured surveys, mapping, and designing improvements and planting. Mr. Williams.

L. A. 411, 412, 413. Planting Design. 3-3-3

Prerequisites: L. A. 201, 202, 203, and 303.

Required of seniors in Landscape Architecture.

Problems in composition with plant materials, presentation details, the preparation of planting plans, and cost data. Messrs. Thurlow, Enersen.

L. A. 421, 422, 423. Landscape Design II. 4-4-4

Prerequisites: L. A. 321, 322, 323.

Required of seniors in Landscape Architecture.

Problems in presentation, and in the design of parks, housing areas, public grounds, and institutional groups. Messrs. Thurlow, Enersen.

L. A. 451, 452, 453. Landscape Construction. 2-2-2

Required of seniors in Landscape Architecture. Prerequisite: C. E. 224, 225, 226, and 227; and L. A. 321, 322, 323.

Problems in design of ground surface, walks, and drives; preparation of plans for grading and drainage; estimates of materials and costs, and specification. Mr. Williams.

L. A. 463. Ethics and Office Practice 0-0-1

Prerequisites: L. A. 451, 452, 453.

Arrangement of equipment, supplies, data, and illustrative and other material in landscape offices; methods of professional procedure, and professional ethics. Mr. Williams.

MATHEMATICS

Courses for Undergraduates

***Math. 101. Algebra for Engineers.** 4-0-0

Required of freshmen in the School of Engineering, and in the Departments of Industrial Management, Industrial Arts, and Landscape Architecture.

Quadratic equations, the progressions, the binomial theorem, logarithms, the general theory of equations, the solution of higher equations, determinants and partial fractions. Staff.

***Math. 102. Trigonometry for Engineers.** 0-4-0

Prerequisite: Math. 101.

Required of freshmen in the School of Engineering, and in the Departments of Industrial Management, Industrial Arts, and Landscape Architecture.

The trigonometric functions, derivation of formulae, the solution of plane and spherical triangles, with practical applications, slide rule, complex numbers, and hyperbolic functions. Staff.

***Math. 103. Analytical Geometry.** 0-0-6

Prerequisite: Math. 102.

Required of freshmen in the School of Engineering, and in the Departments of Industrial Management, Industrial Arts, and Landscape Architecture.

Loci of equations, the straight line, circle, parabola, ellipse, hyperbola, the general equation of the second degree, polar coördinates, transcendental curves, parametric equations, coördinates in space, planes and surfaces. Staff.

Math. 104. Algebra, Trigonometry, Analytical Geometry for Engineers (Supplementary for Transfer Students) 4 or 4 or 4

A course designed to meet the needs of students who have had algebra, trigonometry, and analytical geometry, but who do not have a sufficient number of credits for engineering. The course will include supplementary topics in algebra, trigonometry, and analytical geometry. Staff.

***Math. 111, 112. Mathematics for Agriculture and Textile Students.** 4-4-0

Fundamentals of algebra, trigonometric functions of acute agles, solutions of right triangles, logarithms, slide-rule, simple and fractional equations, graphs and graphical solutions of equations, percentages, ratio and proportion, areas and volumes of common solids, exponents, radicals and imaginary numbers, quadratic equations, simultaneous equations, progressions, the Binomial Theorem, simple and compound interest, elementary statistics, solutions of general triangles. Staff.

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*This course will be repeated the following term.

***Math. 113. Mathematics of Finance.** 0-0-4

Prerequisite: Math. 112.

Simple and compound interest, annuities, sinking funds and amortization, and the valuation of bonds and other applications. Staff.

***Math. 201. Calculus I.** 4-0-0

Prerequisite: Math. 103.

Required of sophomores in Engineering.

A course in the fundamental principles of the calculus, including the formulas for differentiation, and for integration of polynomial functions, with applications to geometry and to problems in rates, maxima and minima, curve tracing, curvature, areas, volumes, work, pressure, velocity and acceleration. Staff.

***Math. 202. Calculus II.** 0-4-0

Prerequisite: Math. 201.

Required of sophomores in Engineering.

A continuation of Calculus I. Methods of integration, and the study of the definite integral, with applications to problems in areas, volumes, lengths of arcs, surfaces, centroids, moments of inertia, radii of gyration, approximate integration. Staff.

***Math. 303. Calculus III.** 0-0-4

Prerequisite: Math. 202.

Required of sophomores in Engineering.

A continuation of Calculus II. Indeterminate forms, infinite series, expansion of functions, hyperbolic functions, partial differentiation, double and triple integrals, and differential equations. Staff.

Math. 311. Approximate Methods in Mathematics. 3 credits.

Prerequisite: Math. 303.

Review of approximate solution of equations and of graphical and numerical differentiation and integration; Newton's interpolation method; network graphs; theory of special-purpose slide rules; elementary theory of nomographs; curve fitting and use of special coordinate paper; approximations by use of differentials.

Special course will not be offered after June 1949.

Math. 312. Mathematics of Finance for Engineers. 3 credits.

Prerequisite: Math. 303.

Simple and compound interest, annuities, sinking funds and amortization, operation of funds in building and loan associations, depreciation, and simple forms of life annuities and life insurance. Interpolation, graphing, and the use of analytical methods.

Special course will not be offered after June 1949.

* This course will be repeated the following term.

Math. 313. History of Mathematics. 3 credits.

Prerequisite: Math. 303.

A study will be made of the lives and contributions of certain outstanding mathematicians as representative of eras in the historical development of mathematics.

Special course will not be offered after June 1949.

Courses for Graduates and Advanced Undergraduates

Math. 401a. Differential Equations. 3-0-0

Prerequisite: Math. 303.

Required of juniors in Electrical Engineering and elective for others.

Solution of standard types of equations; numerous examples in the field of Electrical Engineering. Staff.

Math. 401b. Differential Equations. 3-0-0

Prerequisite: Math. 303.

Elective. Principally for students in Chemical Engineering.

A study of the equations that occur in Applied Chemistry. Much emphasis on graphic methods and numerical work. Staff.

Math. 402. Theory of Equations. 0-3-0

Prerequisite: Math. 303.

Elective.

The usual topics in the theory of equations, the solution of higher equations, exponential equations, logarithmic equations, and determinants. Staff.

Math. 403. Graphical and Numerical Methods. 0-0-3

Prerequisite: Math 303.

Elective.

Graphical and numerical approximate methods in differentiation, integration and the solution of both ordinary and differential equation. Theory of least squares and empirical curve fitting. Numerous examples in the field of physics, electricity, mechanics, and engineering will be solved. Staff.

Math. 411. Advanced Calculus for Engineers. 3-0-0

Prerequisite: Math 401 (a or b).

Elective.

Hyperbolic functions, elliptic integrals and functions, partial differentiation of composite functions, differentiation of integrals, implicit functions. Applications to problems in engineering will be emphasized. Staff.

Math. 412. Advanced Mathematics for Engineers. 0-3-0

Prerequisite: Math. 401a.

Trigonometric and hyperbolic functions of complex angle, series solution of ordinary differential equations with an introduction to Bessel functions, introduction to solution of partial differential equations, Graeffe's method for complex roots as applied to simple cases for cubic and quartic equations, introduction to vector analysis. Staff.

Math. 413. Series for Engineers. 0-0-3

Prerequisite: Math. 401 (a or b).

Elective.

Fourier series, partial differential equations, with applications to problems in physics and engineering. Staff.

Math. 421. Advanced Analytic Geometry. 3-0-0

Prerequisite: Math. 303.

Elective.

The elements of higher plane curves and the geometry of space. Staff.

Math. 422. Theory of Probability. 0-3-0

Prerequisite: Math. 401 (a or b).

Definitions and fundamental relations. Binomial and multinomial distributions, Poisson and normal distributions, probability integral, Mathematical Expectation, Bayes' Theorem. Applications to problems in engineering and statistics. Staff.

Math. 423. Vector Analysis. 0-0-3

Prerequisite: Math. 401 (a or b).

Elective.

Different vector products; the calculus of vectors with applications to geometry and mechanics. Staff.

Courses for Graduates Only

Math. 501a. Ordinary and Partial Differential Equations. 3-0-0

Prerequisite: Math. 401 (a or b).

Solution of ordinary differential equations by simple operational methods; partial differential equations; functions arising from solution of differential equations; applications to problems arising in electrical, civil, and mechanical engineering. Mr. Mumford.

Math. 501b. Ordinary and Partial Differential Equations. 3-0-0

Prerequisite: Math. 401 (a or b).

Material similar to that in Math. 501a, expect that applications will be to problems in Chemical Engineering. Mr. Winton.

Math. 502. Ordinary and Partial Differential Equations. 0-3-0

Prerequisite: Math. 501 (a or b).

Further development of the theory of ordinary and partial differential equations, with extended applications to problems in engineering. Mr. Mumford.

Math. 511. Complex Variable Theory and Applications. 3-0-0

Prerequisite: Math. 401 (a or b).

Elementary functions; analytic functions and Cauchy-Riemann equations; conformal mapping and applications to field theory and flow phenomena; Taylor and Laurent series; contour integration and residue theory. Mr. Bullock.

Math. 512. Operational Mathematics. 0-3-0

Prerequisite: Math. 511.

Fourier integral and applications; Laplace transform and applications to solution of differential equations arising from engineering problems. Mr. Cell.

Math. 513. Advanced Operational Mathematics. 0-0-3

Prerequisite: Math. 512.

Extended development of the theory of the Laplace transform; further applications to engineering problems. Mr. Cell.

Math. 522. Advanced Algebra. 0-3-0

Prerequisite: Math. 303.

Determinant and matrix theory; transformations; quadratic forms; characteristic equation. Mr. Strobel.

Math. 523. Calculus of Finite Differences and Difference Equations. 0-0-3

Prerequisite: Math. 401 (a or b).

Symbolic methods; generating functions; factorial, gamma, and beta functions; binomial coefficients; methods of summation; the numbers and polynomials of Bernoulli, Boole, Euler, Sterling; interpolation; difference equations. Mr. Levine.

Math. 531. Calculus of Variations and Applications. 3-0-0

Prerequisite: Math. 401 (a or b).

Necessary and sufficient conditions for existence of an extremum for an integral which is a function of one or several independent variables; specific examples such as the brachstochrone problem; Hamilton's principle and the principle of least action; brief consideration of the isoperimetric problem and the variable end-point problem.

Math. 532. Advanced Complex Variable Theory and Applications. 0-3-0

Prerequisite: Math. 511.

Further development of series and residue theory; mapping; analytic continuation; the Bromwich contour; applications to engineering problems.

Mr. Bullock.

MECHANICAL ENGINEERING

Courses for Undergraduates

M. E. 101, 102, 103. Engineering Drawing. 2-2-2

Required of freshmen in Engineering, Agric. Engineering, Landscape Architecture and Textiles.

This course covers lettering; instrument practice; geometrical construction; projections; technical sketching, sections; auxiliary projections; revolution; pictorial drawing; fasteners; intersection and development; working drawings; charts and graphs; tracing and blueprinting, and other reproductions. M. E. Staff.

M. E. 111. Woodwork. 1 or 1 or 1

Required of freshmen in Textiles.

Use of bench tools, making cabinet joints, operation and care of woodworking machinery; correct methods of staining, varnishing, filling, and gluing various kinds of wood. Mr. Hobbs.

M. E. 112. Foundry. 1 or 1 or 1

Required of freshmen in Textiles.

Demonstration and practice in molding and core making; cupola practice. Mr. Maddison.

M. E. 113. Forge Work 1 or 1 or 1

Required of freshmen in Textiles.

Hand forging of simple exercises, in mild steel, representative of industrial practice; identification and uses of ferrous metals; welding methods.

Mr. Cope.

M. E. 114. Pattern Making. 1 or 1 or 1

Required of sophomores in I. E., Furniture Option and M. E.

Elementary joinery, finishing, theory of dry-kilning, wood-turning; lectures, demonstrations, and practice in hand work and machine methods; typical patterns and core boxes constructed, such as solid, split, and loose piece. Mr. Hobbs

M. E. 115. Foundry Practice. 1 or 1 or 1

Required of sophomores in I. E., Furniture Option and M. E.

Lectures, demonstrations, and practice in molding and core making, cupola operations; melting and casting of ferrous and none ferrous metals and their alloys; instruction and practice in the testing of molding sands.

Mr. Maddison.

M. E. 116. Forging and Welding. 1 or 1 or 1

Required of sophomores in Ae. E., I. E., and M. E.

A study of the principles and practice of forging: hand forging as correlated with the industrial processes of hammering, rolling, and pressing. Lectures, demonstrations, and practice in forge, oxy-acetylene, and electric welding. Mr. Cope.

M. E. 201. Descriptive Geometry. 2 or 2 or 2

Prerequisite: M. E. 103.

Required of sophomores in Ae. E., C. E., and M. E.

Representation of geometrical magnitudes with points, lines, planes and solids; concurrent noncoplanar forces; the solution of problems.

M. E. Staff.

M. E. 202. Machine Drawing. 2 or 2 or 2

Prerequisite: M. E. 103.

This course covers advanced problems in Applied Descriptive Geometry; piping drawings and valves; technical sketching; welding; aircraft and structural drawings; redesign problems; jigs and fixtures; charts and graphs; use of engineering tables; gears and cams; working drawings with tracing and blueprinting. M. E. Staff.

M. E. 219. Electrical Design. 3 or 3 or 3

Prerequisite: M. E. 103.

Required of sophomores in Electrical Engineering.

This course covers linkages, cams, gears, belting, gear trains and other simple mechanisms; working drawings of simple machines and parts such as motor bases, and other electrical units. Mr. Brown.

M. E. 224. Factory Layout and Equipment. 0-0-3

Prerequisites: M. E. 114, 115, 116.

Required of juniors in I. E.—Furniture Option.

To summarize and coordinate all previous shop courses and show their relation to manufacturing processes; the essential principles of machine-tool operation; machine-tool selection and application for economic production. Mr. Wheeler.

M. E. 227, 228, 229. Machine Shop. 1-1-1

Required of juniors in Ae. E., I. E., M. E., and Yarn Manufacturing.

Practice in laying out work, grinding tools, chipping, drilling, tapping, babbitting bearings, and scraping; machine work, including centering, straight and taper turning, chucking, screw cutting, shaper work, planer work, index milling, gear cutting and grinding. Mr. Wheeler.

M. E. 241, 242, 243. Oxy-Acetylene and Electric Welding. 1-1-1

Prerequisite: M. E. 116 or equivalent.

Elective.

Fundamental methods and principles of fusion welding; welding symbols, economic and metallurgical considerations, selection of method and type of welding. Mr. Cope.

M. E. 307, 308, 309. Engineering Thermodynamics. 3-3-3

Prerequisites: Phys. 203, Math. 303.

Required of juniors in E. E., M. E., Ae. E., C. E., Cer. E., I. E. and seniors in Geol. Eng.

The study of heat as engineering medium, combustion, heat transfer, and the laws governing energy transformations; use of the general energy equation dealing with gases, vapors, and mixtures; application of fundamental principles to design and performance of nozzles, steam engines and turbines, internal-combustion engines, refrigerating machines, and air compressors. M. E. Staff.

M. E. 313, 314, 315. Mechanical Engineering Laboratory I. 1-1-1

Concurrent with M. E. 307, 308, 309.

Required of juniors in E. E., Cer. E., Ae. E., C. E., I. E., M. E., and seniors in Geol. Eng.

Calibrating pressure, temperature, speed, and power-measuring instruments; the testing of fuels, lubricants, pumps, compressors, steam engines, and turbines, heating and ventilating equipment, hydraulic machinery, and internal-combustion engines. M. E. Staff.

M. E. 317, 318, 319. Kinematics. 3-3-3

Prerequisites: E. M. 312 and M. E. 202.

Required of juniors in M. E.

The relative motions, velocities, and accelerations of machine parts, including linkages, cams, gears, and other mechanisms. The elements of machine design, including the determination of design stresses, riveted and welded joints, bearings, belting and rope drives, and the design of basic machine parts. Messrs. Conner, Hoefer.

M. E. 322, 323. Metallurgy. 0-3-3

Prerequisite: Phys. 203.

Required of juniors in M. E. and Ae. E.

The constitution, structure and properties of engineering ferrous and non-ferrous metals and alloys; influences of mechanical working and heat treatment; physical testing; corrosion and its prevention. Mr. Guy.

M. E. 350. Advanced Engineering Drawing. 0-3 or 3

Prerequisites: M. E. 103 and M. E. 201, 202.

Elective for Advanced Engineering undergraduates.

This course covers work as related to special problems in various engineering fields. It also includes lectures, recitations, and individual conferences. Messrs. Briggs, Brown, Moose.

Courses for Graduates and Advanced Undergraduates

M. E. 401, 402, 403. Power Plants. 3-3-3

Prerequisites: M. E. 309 and M. E. 315.

Required of seniors in Mechanical Engineering.

Fuels and combustion; heat balance, steam boilers, prime movers, and auxiliaries, as applied to power generation. Messrs. Hanson, Doolittle.

M. E. 405. Refrigeration. 0-3-0

Prerequisite: M. E. 309 or Ch. E. 415.

An analysis of the simple, compound, centrifugal and multiple effect compression system, the steam jet and the absorption sytsems of refrigeration.

M. E. 407, 408, 409. Mechanical Engineering Laboratory II. 1-1-1

Prerequisites: M. E. 313, 314, 315.

Required of seniors in Mechanical Engineering.

Advanced study and tests in the fields of power plants, heating and ventilation, metallurgy, fluid flow, compressed air, fuels and combustion, and lubrication. Mr. Bridges.

M. E. 411, 412, 413. Machine Design. 3-3-3

Prerequisites: M. E. 317, 318, 319, E. M. 422.

Required of seniors in Mechanical Engineering.

A continuation of M. E. 319. The design of machine members, including screws, keys, shafts, couplings, clutches, brakes, springs, gearing, frames, flywheels, etc., the dynamics of machinery and engines.

Messrs. Conner, Hoefer.

M. E. 418. Metallurgical Factors in Design. 3-0-0

Prerequisite: M. E. 323.

Study of the metallurgical factors that must be considered in using metals in design.

M. E. 441, 442, 443. Physical Metallurgy. 3-3-3

Prerequisite: M. E. 323.

Theories concerning behavior and control of engineering alloys, reaction rates in the solid state and alloy influences; current heat treating practices; surface treatments; behavior of metals at high and low temperatures; special purpose alloys; powder metallurgy; review of modern equipment and methods for the study of metals. Graduate Staff.

M. E. 451, 452, 453. Heating and Air-Conditioning. 3-3-3

Prerequisite: M. E. 309 or Ch. E. 415.

Principles of heating, ventilation, and refrigeration as applied to air-conditioning; design and operation of air-conditioning systems.

Mr. Vaughan.

M. E. 461, 462, 463. Experimental Engineering. 3-3-3

Prerequisites: M. E. 313, 314, 315 or equivalent as approved by faculty group.

Advanced engineering principles applied to a specific project dealing with heat, power, hydraulic machinery, metallography, aerodynamics, or general experimental work. A seminar period provided, and a written report required. Graduate Staff.

M. E. 464. Heat Transfer. 0-3-0

Prerequisite: M. E. 309 or Ch. E. 415.

A study of the various methods of heat transfer both in the steady and unsteady states with applications to building materials, other insulating materials, and to heat exchanging equipment.

Courses for Graduates Only

M. E. 501, 502, 503. Advanced Engineering Thermodynamics. 3-3-3

Prerequisite: M. E. 403.

An intensive study of the fundamental thermodynamic principles and their application to advanced engineering problems.

M. E. 505, 506, 507. Advanced Machine Design. 3-3-3

Prerequisite: M. E. 413.

Continued application of the principles of Mechanics and the Strength of Materials to the design of machine elements, culminating in the design of composite machines. Economic considerations are stressed and an effort is made to develop good judgment and a sense of proportion in the student.

M. E. 513, 514, 515. Advanced Power Plants. 3-3-3

Prerequisite: M. E. 403.

A study of the interrelation of the various pieces of equipment in several types of power plants and their effects on the performance on the plant as a whole.

M. E. 517, 518, 519. Heating and Air Conditioning Design. 3-3-3

Prerequisites: M. E. 453 and M. E. 407, 408 and 409.

The design of a heating system for specific conditions; specifications for installation, performance tests of heating equipment.

M. E. 521, 522, 523. Mechanical Engineering Research. 3-3-3

Prerequisites: M. E. 403, 413.

Research and thesis in connection with M. E. 505, 506, 507; M. E. 513, 514, 515; M. E. 517, 518, 519.

M. E. 525, 526, 527. Mechanical Engineering Seminar. 1-1-1

Faculty and graduate student discussions centered around current research problems and advanced engineering theories and developments.

M. E. 531, 532, 533. Machinery Laboratory. 1-1-1

Prerequisite: M. E. 413.

Experimental work on various phases of design and machine analyses. The work will consist of experiments in machine stress analysis by several methods, vibrations, and lubrication.

M. E. 541, 542. Mechanics of Machinery. 0-3-3

Prerequisites: M. E. 413, Math. 401a.

Advanced study of the Kinematics and Kinetics of Machines, with special emphasis on static and inertia forces. The course includes balancing of machinery, and the complete force analysis of a machine.

M. E. 551, 552, 553. Project work in Mechanical Engineering. 1-1-1

Prerequisite: Graduate Standing in Mech. Engr.

Individually assigned design, construction or analytical projects, performed by the student under the guidance of the instructor. A report on the year's work, meeting the specifications of the Graduate School for the Master's Thesis is required.

AERONAUTICAL OPTION

Courses for Advanced Undergraduates

Ae. E. 310. Elements of Aeronautical Engineering. 0-0-3

Prerequisites: Phys. 203; Math. 303.

Required of juniors in Aero. Option.

Introduction to aircraft, their components and general principles of flight. Mr. Truitt.

Ae. E. 421, 422, 423. Airplane Design. 3-3-3

Prerequisites: E. M. 313, E. M. 321, and Ae. E. 310.

Required of seniors in Aero. Option.

A study of the design and construction of airplanes. Work in class and drafting room of a complete airplane design project including preliminary layout, detail design, CAA requirements for design, and stress analysis of the structure as required by the Department of Commerce. Mr. Truitt.

Ae. E. 431, 432, 433. Aerodynamics. 3-3-3

Prerequisites: Math. 401a, Ae. E. 310.

Required of seniors in Aero. Option.

A study of engineering aerodynamics, airplane performance, stability and control; including an introduction to transonic and supersonic aerodynamics. Mr. Truitt.

Ae. E. 441, 442, 443. Aeronautical Laboratory. 1-1-1

Prerequisites: M. E. 309 and M. E. 315.

Required of seniors in Aero. Option.

Windtunnel testing of airplane components, bluff bodies, airfoils, laminar and turbulent flows. Structural testing of modern airplane parts with special emphasis on CAA load test requirements. A study of modern aircraft engines, hydraulic systems, and instrument design. Mr. Truitt.

Ae. E. 451. Aircraft Engines. 0-0-3

Prerequisite: M. E. 309.

Elective.

The practical aspects of airplane engine operation and design including carburetors, magnetos, super-chargers, fuel and oil systems, engine installation and accessories. A survey of recent advances in jet propulsion systems. Staff.

Ae. E. 461. Aircraft Instruments. 3-0-0

Prerequisites: Ae. E. 310.

Elective.

A study of modern aircraft instruments including powerplant, flight and navigation instruments. Mr. Truitt.

Ae. E. 471. Propeller and Rotary Wing Design. 0-3-0

Prerequisite: Ae. E. 310.

Elective.

A study of the design of aircraft propellers and rotary wing theory and design. Discussions of problems of performance evaluation, control and stability, as applied to rotating wing aircraft. Mr. Truitt.

Courses for Graduates Only

Ae. E. 520, 521, 522. Project Work in Aeronautical Engineering. 3-3-3

Prerequisite: Graduate standing in Aero. Eng.

Individually assigned design, construction, or analytical projects, performed by the student under the guidance of the instructor. A report on the year's work, meeting the specifications of the Graduate School for the Master's Thesis is required.

Ae. E. 531, 532, 533. Advanced Aerodynamics. 3-3-3

Prerequisite: Ae. E. 433.

Required in Fifth-year curriculum in Aero. Option.

Mathematical and theoretical treatment of aerodynamics of non-viscous and viscous fluids. Introduction to conformal transformation and three dimensional flows. Supersonic aerodynamics including critical Mach numbers, shock wave mechanics and supersonic airfoil theory.

Ae. E. 541, 542, 543. Aeronautical Engineering Seminar. 1-1-1

Prerequisite: Ae. E. 423.

Required in Fifth-year curriculum in Aero. Option.

Faculty and Graduate Student discussions in connection with graduate project. Discussions and reports on current aeronautical research and engineering practices.

Ae. E. 551, 552. Hydrodynamics. 0-3-3

Required in Fifth-Year Curriculum in Aero. Option.

Co-requisites: Ae. E. 532, 533.

Resume of modern theoretical Hydrodynamics and hydraulics in connection with aerodynamics. Emphasis is places on Hydrodynamic design of seaplane hulls and the design and testing of models in the various types of towing tanks. Study of stability problems of seaplane hulls and float combinations.

Ae. E. 561, 562, 563. Advanced Performance Problems. 3-3-3

Prerequisite: Ae. E. 433.

A study of ideal airplane performance problems; qualitative and quantitative performance analysis; engine performance problems; dimensionless performance analysis; sea-level and altitude flight; advanced airplane control and stability; Lanchester's Phugoid theory, and the theory of dynamic stability.

Ae. E. 571, 572, 573. Theory and Design of Aircraft Structures. 3-3-3

Required in Fifth-Year Curriculum in Aero. Option.

Prerequisite: Ae. E. 423.

The study of design methods for structural components subjected to any given combination of loads. Methods of structural analysis of various structural types used for the major structural items of a modern metal airplane. Study includes: truss and frame analysis; problem of instability; analysis of thin wall structures.

MILITARY SCIENCE AND TACTICS

The Elementary Course

Military 101, 102, 103* 2-2-2

Military Science I.

This course is required of all physically fit male freshmen. Instruction is given in the following subjects: Military Organization; Hygiene and First Aid; Leadership, Drill, and Exercise of Command; Individual Weapons and Marksmanship; Maps and Aerial Photographs; National Defense Act and The Reserve Officers Training Corps. (ROTC.)

Military 201, 202, 203. 2-2-2

Military Science II.

This course is required of all physically fit male sophomores who have completed Military Science I. Instruction is given in the following subjects: Leadership, Drill, and Exercise of Command; Physical Development Methods; Maps and Aerial Photographs; Military Administration; Evolution of Warfare; Military Law and Boards.

The Advanced Course

The Advanced Course is open to selected Juniors who have completed Military Science I and II, and to selected Veterans, who are sophomores or juniors in good standing and who had a year or more of active service in the Armed Forces during the period 1 January 1941 to 2 March 1946. Both years of the advanced course include subjects which are common to all arms and services as follows:

First Year Advanced Course (Military Science III): Military Leadership, Psychology, and Personnel Management; Leadership, Drill and Exercise of Command; Geographical Foundations of National Power; Military Law and Boards.

Second Year Advanced Course (Military Science IV): Command and Staff; Military Teaching Methods; Psychological Warfare; Military Problems of the United States; Leadership, Drill and Exercise of Command; Military Mobilization and Demobilization; Combat Intelligence.

Common subjects are supplemented by instruction in Tactics and Technique of the Force, Arm or Service in which the student is enrolled as follows:

Military 301, 302, 303. 3-3-3

Military Science III. (Infantry)

Prerequisites: Military Science I and II (or Veteran's credit).

In addition to the subjects which are common to all branches, the following branch subjects are taught: Communications; Gunnery, Technique of Fire, and Fire Control; Motors and Transportation; Organization of the Infantry, Infantry Tactics; The Military Team; Troop Movements.

* All Veterans in service as long as six months are excused from this course.

Military 311, 312, 313. 3-3-3

Military Science III. (Signal Corps)

Prerequisites: Military Science I and II (or Veteran's credit).

This course is limited to students with an Engineering Curriculum. In addition to the subjects which are common to all branches, the following branch subjects are taughts: Organization and Missions of the Signal Corps; Organization of the Infantry and Armored Divisions, their Signal and Communication Components; Communication Security; Signal Orders; Message Center and Signal Center Procedure; Field Wire Communication Fundamentals; Field Radio Communication Fundamentals; Signal Corps Photography; The place of the Signal Corps in the Military Team.

Military 321, 322, 323. 3-3-3

Military Science III. (Air Force)

Prerequisites: Military Science I and II (or Veteran's credit).

This course is limted to students with an Engineering Curriculum. In addition to the subjects which are common to all branches, the following branch subjects are taught: History of the AAF; Organization of the AAF; Personnel Management; AAF Training; AAF Inspection Systems; AAF Statistical Control System; AAF Supply; Transportation; Navigation; Aeronautics; Meteorology; Communications; Air Intelligence and Combat Orders; Air Operations; Guided Missiles.

Military 331, 332, 333. 3-3-3

Military Science III. (Corps of Engineers)

Prerequisites: Military Science I and II (or Veteran's credit).

This course is limited to students with an Engineering Curriculum. In addition to the subjects which are common to all branches, the following branch subjects are taught: Bridge Design and Classification; Camouflage; Engineer Combat Principles; Engineer Reconnaissance; Explosives and Demolitions; Job Management; Military Roads; Military Sketching; Organization of Engineer Units; Organization of the Ground and Field Fortifications; The place of Engineers in the Military Team.

Military 341, 342, 343. 3-3-3

Military Science III. (Ordnance Department)

Prerequisites: Military Science I and II (or Veteran's credit).

This course is limited to students with an Engineering Curriculum. In addition to the subjects which are common to all branches, the following branch subjects are taught: Organization of the Ordnance Department; The place of the Ordnance in the Military Team; Maintenance and Supply Procedures; Ammunition (1) Materiel, (2) Supply; Automotive Materiel; Artillery Materiel; Small Arms Materiel; Fire Control Materiel.

Military 351, 352, 353. 3-3-3

Military Science III. (Quartermaster Corps)

Prerequisites: Military Science I and II (or Veteran's credit).

In addition to the subjects which are common to all branches, the following branch subjects are taught: Administration of Civilian Personnel; Classification of Supplies (use of stock catalogs and bases of allowances); Depot Supply I; Organization and Functions of the Quartermaster Corps; Organization for Supply in the Army; Property Accountability and Responsibility; Station Supply I; Organization, Functions, and Operation of Quartermaster Units; Unit and Organization Supply.

Military 401, 402, 403. 3-3-3

Military Science IV. (Infantry)

Prerequisites: Military 301, 302, 303.

In addition to the subjects which are common to all branches, the following branch subjects are taught: Communications; Gunnery, Technique of Fire, and Fire Control; New Developments; Supply and Maintenance; Tactics; Troop Movements.

Military 411, 412, 413. 3-3-3

Military Science IV. (Signal Corps)

Prerequisites: Military 311, 312, 313.

In addition to the subjects which are common to all branches, the following branch subjects are taught: Wire Communication—Materiel; Radio Communication—Materiel; Applied Signal Communications for the Division; Signal Supply and Repair; Higher Echelon Signal Communication and Equipment.

Military 421, 422, 423. 3-3-3

Military Science IV (Air Forces—Aircraft Maintenance Engineering)

Prerequisites: Military 321, 322, 323.

In addition to the subjects which are common to all branches, the following branch subjects are taught: The Aircraft Maintenance Officer; Technical Publications; Technical Supply; Inspection and Maintenance Procedures; Flight Line Maintenance; Specialized Maintenance; Crew Chief System; Base Shops; Maintenance Control; Supervision of Maintenance; The Air Inspector; Flight Tests; Evaluation and Testing.

Military 425, 426, 427. 3-3-3

Military Science IV. (Air Forces—AAF Communications Course)

Prerequisites: Military 321, 322, 323.

In addition to the subjects which are common to all branches, the following branch subjects are taught: Introduction to AAF Communications; Administration; Supply and Maintenance; Radio Communications; General; Aircraft Radio; Ground Radio; Survey of Radar; Wire Communications; Visual Communications.

Military 431, 432, 433. 3-3-3

Military Science IV. (Corps of Engineers)

Prerequisites: Military 331, 332, 333.

In addition to the subjects which are common to all branches the following branch subjects are taught: Airborne and Amphibious Operation; Construction and Utilities; Engineer Combat Principles; Engineer Estimates and Orders; Engineer Reconnaissance; Engineer Signal Communications; Engineer Supply; River-Crossing Operations; Water Supply.

Military 441, 442, 443. 3-3-3

Military Science IV. (Ordnance Department)

Prerequisites: Military 341, 342, 343.

In addition to the subjects which are common to all branches, the following branch subjects are taught: Maintenance and Supply Procedures; Ammunition, Materiel and Supply; Automotive Materiel; Small Arms Materiel; Fire Control Materiel; Materiel Specialty Instructions.

Military 451, 452, 453. 3-3-3

Military Science IV. (Quartermaster Corps)

Prerequisites: Military 351, 352, 353.

In addition to the subjects which are common to all branches the following branch subjects are taught: Depot Supply II; Fiscal Procedures; Procurement Procedures; Station Supply II; Storage, Warehousing and Materials Handling; Quartermaster Inspection Service.

MODERN LANGUAGES

Courses in this department numbered above M.L. 106 need not be followed as a gamut sequence but may be taken in any order desired.

Undergraduate students who contemplate doing graduate work leading to the degrees of Master of Science and Doctor of Philosophy should begin their language studies as early as possible in their courses. Before registering for language courses, such students should confer with the head of the department.

Translation Service.—A special feature of the work of the Modern Language department is that of the Translation Service. This work is conducted as an aid to research, on the one hand, and a means to the acquisition of a reading knowledge of the respective language, on the other. Through this service advanced undergraduate students and graduate students registered in technical and scientific courses are given the opportunity of working a translation project in connection with their field of major interest. When such project is satisfactorily completed, it is accepted in lieu of an examination as evidence of reading ability. This procedure is recommended as the preferable method of preparation for the acquisition of a reading knowledge of the language concerned. Revised copies of these projects are deposited in our local library and made available to investigators in other institutions through the medium of the American Documentation Institute.

FRENCH

***M. L. 101, 102. Elementary French.** 3-3-0 or 0-3-3

Lectures on the structure, diction, pronunciation; and other matters of technique of the language, supplemented by easy readings and translations. Individual reports and conferences. No previous training in the language necessary. Miss Riddick.

****M. L. 201, 202, 203. French Prose.** 3-3-3

Prerequisites: M. L. 101, 102, or equivalent.

Selections from literary and historical French Prose. Attention given to the acquisition and extension of the students' basic vocabulary. Choice in parallel reading a matter of individual need. Reports and personal conferences. Miss Riddick.

M. L. 301, 302. Masterpieces of French Literature. 3-3-0 or 0-3-3

Prerequisite: Sophomore, Junior or Senior standing.

The study of outstanding masterpieces of French literature. A brief outline of French literary development. Parallel reading either in translation or in French. An open elective. No language prerequisites.
Mr. Hinkle, Miss Riddick.

M. L. 303. French Civilization. 0-0-3 or 3-0-0

Prerequisite: Sophomore, Junior or Senior standing.

After a preliminary survey of the land and people of France, such topics as language, arts, science, literature, philosophy, etc., are given special consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Mr. Hinkle, Miss Riddick.

M. L. 311, 312. Introductory Scientific French. 3-3-0 or 0-3-3

Prerequisite: M. L. 201 or equivalent.

A study of scientific French of intermediate difficulty, supplemented with lectures on terminilogy and other linguistic technique. The needs of students whose interest is that of the acquisition of a reading knowledge of the language, constantly kept in view. Basic technique of translation explained and demonstrated by means of personal conferences. Miss Riddick.

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* Credit for M. L. 101 is dependent upon completion of M. L. 102.

** Two years of high-school work will ordinarily be considered the equivalent of M. L. 101, 102.

M. L. 401, 402, 403. Advanced Scientific French. 3-3-3

Prerequisite: M. L. 311 or 312 or equivalent.

A study of scientific literature appearing in current bulletins, magazines and technical journals. Students given the opportunity of working a translation project in connection with their subject of major interest. Special attention given to the comprehension of the thought of the article under consideration and its accurate rendition into English. Parallel readings, reports and conferences. Mr. Hinkle and Miss Riddick.

GERMAN

***M. L. 103, 104. Elementary German.** 3-3-0 or 0-3-3

Lectures on the structure and technique of the language, supplemented by easy readings and translations. Individual reports and conferences. Mr. Hinkle, Mrs. Hall.

****M. L. 204, 205, 206. German Prose.** 3-3-3

Prerequisites: M. L. 103, 104 or equivalent.

Selections from literary and historical German Prose. Attention given to the acquisition and extension of the students' basic vocabulary. Choice in parallel reading, a matter of individual need. Reports and personal conferences. Mr. Allred, Mrs. Hall.

M. L. 304, 305. Masterpieces of German Literature. 3-3-0 or 0-3-3

Prerequisite: Sophomore, Junior or Senior standing.

The study of outstanding masterpieces of German literature. A brief outline of German literary development. Parallel readings either in translation or in German. An open elective. No language prerequisites. Mr. Hinkle.

M. L. 306. German Civilization. 0-0-3 or 3-0-0

Prerequisite: Sophomore, Junior or Senior standing.

After a preliminary survey of the land and people of Germany, such topics as language, arts, science, literature, philosophy, etc., are given special consideration. Parallel readings, reports, and conferencs. An open elective. No language prerequisites. Mr. Hinkle, Mrs. Hall.

M. L. 314, 315. Introductory Scientific German. 3-3-0 or 0-3-3

Prerequisite: M. L. 204 or equivalent.

A study of scientific German of intermediate difficulty supplemented with lectures on terminology and other linguistic technique. The needs of students whose interest is that of the acquisition of a reading knowledge of the language, constantly kept in view. Basic technique of translation explained and demonstrated by means of personal conferences. Messrs. Allred, Hinkle.

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* Credit for M. L. 103 is dependent upon completion of M. L. 104.

** Two years of high-school work will ordinarily be considered the equivalent of M. L. 103, 104.

M. L. 404, 405, 406. Advanced Scientific German. 3-3-3
Prerequisite: M. L. 314 or 315 or equivalent.
Reading and translations of relatively simple technical German, supplemented by lectures on terminology, word order, vocabulary analysis and other linguistic technique. Designed to meet the needs of students whose interest in the language is primarily that of reading ability. Choice of reading material adjusted to individual needs; may be taken by students of varying degrees of previous linguistic training. Mr. Hinkle.

SPANISH

***M. L. 105, 106. Elementary Spanish.** 3-3-0 or 0-3-3 or 3-0-3
Lectures on the structure, diction, pronunciation, and other matters of technique of the language, supplemented by easy readings and translations. Individual reports and conferences. No previous training in the language necessary. Messrs. Allred, Ballenger, Hinkle.

****M. L. 207, 208, 209. Spanish Prose.** 3-3-3
Prerequisites: M. L. 105, 106, or equivalent.
Selections from literary and historical Spanish Prose. Attention given to the acquisition and extension of the students' basic vocabulary. Choice in parallel reading, a matter of individual need. Reports and personal conferences. Messrs. Allred, Ballenger.

M. L. 307, 308. Masterpieces of Spanish Literature. 3-3-0 or 0-3-3
Prerequisite: Sophomore, Junior or Senior standing.
The study of outstanding masterpieces of Spanish literature. A brief outline of Spanish literary development. Parallel readings either in translation or in Spanish. An open elective. No language prerequisites.
Messrs. Ballenger, Hinkle.

M. L. 309. Spanish Civilization. 0-0-3 or 3-0-0
Prerequisite: Sophomore, Junior or Senior standing.
After a preliminary survey of the land and people of Spain, such topics as language, arts, science, literature, philosophy, etc., are given special consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Messrs. Hinkle, Ballenger.

M. L. 317, 318. Commercial and Industrial Spanish. 3-3-0 or 0-3-3
Prerequisite: M. L. 207 or equivalent.
A study of technical and industrial literature. Particular attention given to the special terminology characteristic of such literature with a view to the acquisition of a practical vocabulary. Individual conferences and reports. Mr. Ballenger.

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* Credit for M. L. 105 is dependent upon completion of M. L. 106.
** Two years of high-school work will ordinarily be considered the equivalent of M. L. 105, 106.

M. L. 407, 408, 409. Scientific Spanish. 3-3-3

Prerequisites: M. L. 317, 318 or equivalent.

A study of scientific literature appearing in current bulletins, magazines, and technical journals. Students given the opportunity of working a translation project in connection with their subject of major interest. Special attention given to the comprehension of the thought of the article under consideration and its accurate rendition into English. Parallel readings, reports, and conferences. Messrs. Ballenger, Hinkle.

ENGLISH FOR FOREIGN STUDENTS

M. L. 107, 108, 109. Elementary English. 3-3-3

In this course special emphasis is placed upon the acquisition of a practical knowledge of English grammar, including idiomatic expressions, spelling, and vocabulary; practice is given in accurate pronunciation and enunciation. In the written work required, particular emphasis is placed upon punctuation, choice of words, paragraphing, and the organization of simple and practical material. Mr. Hinkle, Mrs. Hall.

M. L. S-1. Oral Composition. 0-0-0

The principal objective of this course is that of broadening the student's vocabulary and improving his pronunciation and enunciation. Practice in speaking is emphasized and individual oral reports are required. Much time is spent on English sounds which present especial difficulty to foreigners. Mastery of such sounds before the end of the course is the ideal of attainment. Mr. Hinkle, Mrs. Hall.

M. L. S-2. Reading for Comprehension. 0-0-0

The basis for this course is the reading of classic and current literature. Emphasis is placed on daily oral or written reports paraphasing the material read. Oral reading exercises are given in which the student is required to reproduce the written page in an understandable and expressive manner. Mr. Hinkle, Mrs. Hall.

GENERAL COURSES

M. L. 321. Masterpieces of Foreign Literature. 3-3-0 or 0-3-3

Prerequisite: Sophomore, Junior or Senior standing.

A study of outstanding literary productions in each of the various types of literature, and lectures on their cultural background. Designed primarily to meet the needs of students who wish to supplement their knowledge of their own literature with a survey of the literature of other civilizations. Special attention is given to the literary monuments of France, Germany, Spain, and Italy. No foreign language prerequisites are necessary. Daily reports and conferences. Mr. Hinkle.

M. L. 322. The Development of Language. **0-0-3 or 3-0-0**

Prerequisite: Sophomore, Junior or Senior standing.

The various phases of linguistic growth as a basis for intelligent language appreciation. Origin of language, linguistic change, grammatical categories, dialects, standard language, word order, inflection, isolation, agglutination, etymology, and other linguistic processes given special consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Mr. Hinkle.

PHYSICAL EDUCATION

Courses and Activities

P. E. 101, 102, 103. Physical Education and Hygiene. **1-1-1**

Required of all freshmen except those excused on the recommendation of the College physician.

Individual health and physical efficiency of each student based on standardized athletic, gymnastic, and efficiency tests. Lectures on personal hygiene required in one term only. Mr. Miller and Staff.

P. E. 201, 202, 203. Physical Education. **1-1-1**

Prerequisites: P. E. 101, 102, 103.

Required of all sophomores except those excused upon recommendation of the College physician.

Election is permitted in popular sports for healthful exercise and a fair degree of skill in them. Mr. Miller and Staff.

P. E. 111, 112, 113. Physical Education. **1-1-1**

Required of all freshmen excused from P. E. 101, 102, 103.

Special activities for those students who cannot meet the requirements of the regular course because of physical handicap. Mr. Miller and Staff.

P. E. 211, 212, 213. Physical Education. **1-1-1**

Required of all sophomores excused from P. E. 201, 202, 203.

Special activities for those students who cannot meet the requirements of the regular course because of physical handicap. Mr. Miller and Staff.

PHYSICS

Courses for Undergraduates

Phys. 111, 112, 113. General Physics. **4-4-4**

Required of sophomores in Textile.

Recitations with demonstrations and laboratory work; presented at college level. Phys. 111, Mechanics; Phys. 112, heat and light; Phys. 113, sound and electricity. **Staff.**

Phys. 115. General Physics. 5 or 5 or 5

Required of sophomores in agricultural curricula A, C, D, and F.

Recitations with demonstrations and laboratory work; a short course with emphasis on mechanics, heat and weather, applications of light and electricity on the farm. Staff.

Phys. 123. Descriptive Astronomy. 0-0-3

An elementary nonmathematical survey of the sun, planets, and stars; observations with telescope. Staff.

Phys. 201, 202, 203. General Physics. 5-5-5

Co-requisite: Math. 201.

Required of sophomores in Engineering and Agricultural curriculum B.

General Physics, somewhat more analytical in content than Physics. 111, 112, 113, stressing problem solution and engineering applications. Recitations, demonstrated lectures, problem drill and laboratory work are coordinated to give a working knowledge of the basic principles of Physics. Phys. 201, mechanics; Phys. 202, sound and electricity; Phys. 203, heat and light. Staff.

Phys. 311. Light and Color in Industry. 3 or 3 or 3

Prerequisite: Phys. 113 or its equivalent.

Required of Textile students; elective for other students.

Survey of the fundamental principles of light and radiation; photometry, illumination and distribution of light; lighting calculations; flourescent lighting; the physiological and psychological aspects of light and color; color theories, standardization of color; color contrast, and color harmony. Special emphasis placed on development of color harmony. Mr. Lancaster

Phys. 322. Descriptive Meteorology. 0-3-0

Prerequisite: Phys. 112 or equivalent.

Explanation of the weather and associated phenomena at an introductory level. Structure of the atmosphere; instrumentation; heat balance and primary circulation of the atmosphere; air masses, fronts, and waves; tertiary circulations; atmosphere of the lowest 10 meters. Mr. Harding.

Phys. 323. Applied Meteorology. 0-0-3

Prerequisite: Phys. 322 or equivalent.

Technique of application of meteorological data to problems in Engineering, Agriculture, Forestry, etc., where weather is a factor, using principle of expectations as the basis for analysis. Examples from several fields as illustrations of various analysis techniques. Mr. Harding.

Phys. 332. Photography. 3 or 3 or 3

Prerequisite: Phys. 113 or equivalent.

A general study of cameras, lenses, exposure, development, printing, types of emulsion, color sensitivity and color filters. Mr. Patterson.

Courses for Graduates and Advanced Undergraduates

Phys. 405, 406. Electricity and Magnetism. 3-3-0

Prerequisites: Phys. 203, Math. 303.

Electric and magnetic potential; theory of dielectrics; methods of measurement of electrical and magnetic quantities; electromagnetic induction; magnetic circuits; direct current and alternating current networks; electromagnetic wave propagation; thermoelectricity and applications. Mr. Stainback.

Phys. 407. Modern Physics. 3 or 3 or 3

Prerequisites: Phys. 203, Math. 303.

Recent discoveries in Physics such as: atomic dimension, electron charge, quantization, atomic structure, spectra, spectrum analysis, X-rays, crystal structure, photoelectric effect, photoelasticity, electron emission, electron tubes, radiation, radioactivity, isotopes, artificial radioactivity, atomic energy, nuclear theory, photon mass and electron waves, cosmic rays, other particles of modern Physics. Mr. Lynn.

Phys. 412. Vibration and Wave Motion. 0-3-0

Prerequisites: Phys. 203, Math. 401.

The dynamics of vibratory and oscillatory motion. Analogies in mechanical, electrical and acoustical vibrating systems. Analysis of wave motion and propagation in different media. Mr. Lancaster.

Phys. 413. Applied Acoustics. 0-0-3

Prerequisite: Phys. 412 or the equivalent.

The dynamical theory of sound. Sources of sound, measurement of sound intensity, measurement of frequency, acoustical impedance and transmission of sound, sound filters and resonators, acoustics of speech and hearing, reception and reproduction of sound, acoustics of buildings. Mr. Lancaster.

Phys. 415, 416. Geometrical and Physical Optics. 3-3-0

Prerequisites: Phys. 203, Math 303.

Reflection, refraction, dispersion, aberrations, the eye, vision through lens, optical instruments, velocity of light, light waves, the spectrum, interference, diffraction, polarization, colors. Staff.

Phys. 426. Spectroscopy in Industry. 0-3-0 or 0-4-0

Prerequisites: Phys. 203, Chem. 212.

Fundamental principles of light, spectroscopic equipment; spectra; qualitative analysis of composition by emmission spectra; detection of impurities; quantitative analysis; absorption spectra; industrial applications, lectures, demonstrations, and laboratory. Staff.

Phys. 429. Applied Optics. 0-0-3

Prerequisites: Phys. 415, 416.

A course dealing with the design, optical properties and applications of the instruments used in microscopy, photomicroscopy, photometry, spectrophotometry, photography, colorimetry, polarimetry, interferometry, refractometry, etc. Staff.

Phys. 431, 432, 433. Advanced Physical Measurements. 2-2-2

Prerequisites: Phys. 203, Math. 303.

Covers the technique and theory of advanced experiments in mechanics, heat, sound, light, and electricity. The treatment and interpretation of data will be stressed. Staff.

Phys. 441. Physics in Industry. 3-0-0

Prerequisites: Phys. 203, Math. 303.

This course is of a seminar character and deals with physical phenomena of importance in industry. Special empahsis will be placed on problems dealt with in the contemporary literature and on the means by which the various fields of physics are assisting in industrial progress.

Staff.

Phys. 463. X-Rays in Industry. 3-0-0

Prerequisites: Phys. 203, Math. 303.

Theory and practice of X-rays in industry; X-ray equipment; photographic procedure; detection of defects in welds, castings, assemblies, stresses in members and fibers and crystal analysis demonstrations with student manipulation in each phase. Staff.

Physics Colloquium

A bi-weekly meeting of staff members and advanced students for the purpose of reviewing current literature and research.

Courses for Graduates Only

Phys. 501. Advanced Mechanics. 3-0-0

Prerequisites: E. M. 313, Math. 401 and 423.

The differential equations of motion applied to particles and rigid bodies, motion relative to moving axes, dynamics of deformable bodies, introduction to generalized coordinates, Lagrange's equations and the Hamilton-Jacobi partial differential equation. Mr. Meares.

Phys. 513. Advanced Heat. 0-0-3

Prerequisites: Phys. 203, Math. 401, or their equivalents.

Thermal properties of matter, kinetic theory, the first and second laws of thermodynamics. Mr. Lynn.

Phys. 514, 515. Advanced Electricity and Magnetism. 0-3-3

Prerequisites: Phys. 203, Math. 401, 423.

A treatment of electrostatic and electrodynamic phenomena by the use of differential equations and vector analysis. Condensers, dielectrics, potential distributions, steady currents, magnetic interaction of currents, electromagnetic induction, transient and alternating currents in networks, eddy currents, magnetism, electromagnetic waves. Mr. Lancaster.

Phys. 522. Discharge of Electricity in Gases. 0-3-0

Prerequisites: Phys. 407, Math. 401.

Production of ions in gases, motion of ions, velocity in an electric field, diffusion, recombination , determination of atomic charge, ionization by collision, discharge tubes, cathode rays, positive rays, and X-rays.

Staff.

Phys. 525. Atomic Structure. 3-0-0

Prerequisite: Phys. 407.

Origin of X-rays, scattering and absorption, methods of X-ray diffraction; waves and particles; Bohr-Sommerfeld theory of atoms; Stark and Zeeman Effects, periodic system, atomic spectra and electron distribution; isotopes, radioactivity, nuclear structure. Mr. Lancaster.

Phys. 527. Nuclear Physics. 0-0-3

Prerequisite: Phys. 407.

A study of the structure of atomic nuclei, natural and artificial radioactivity. Apparatus and particles used in producing transmutations. Properties of the disintegration products and methods of detecting them. Nuclear reactions and the energy involved in transmutations. Mr. Meares.

Phys. 531, 532, 533. Research. 3-3-3

Graduate students sufficiently prepared may undertake research in some particular field of Physics. At least six laboratory hours a week must be devoted to such research. Staff.

Phys. 541, 542, 543. Special Problems. 1-1-1

Thesis project for students in fifth year Engineering Physics course.

POULTRY

Courses for Undergraduates

Poul. 101. General Poultry. 4-0 or 4

Fundamental principles of poultry production. Mr. Kelly.

Poul. 301. Poultry Judging. 4-0-0

Prerequisite: Poul. 101.

Required of juniors in Poultry Science; elective for others.

Mr. Williams.

Poul. 303. Incubation and Brooding. 0-0-4

Prerequisites: Phys. 115, Poul. 101.

Required of juniors in Poultry Production; elective for others.

Principles of incubation and brooding; feeding, housing, and rearing baby chicks. Mr. Williams.

Poul. 311. Poultry Anatomy and Physiology. 5-0-0

Prerequisites: Poul. 101, Zool. 201.

Required of seniors in Poultry Science; elective for others. A foundation course for poultry nutrition, and diseases. Dissection and study of the gross structures and functions of the organs and systems of the embryo, baby chick, chicken and adult bird. Mr. Cook.

Poul. 322. Poultry Production. 0-4-0

Prerequisite: Poul. 101.

Developed for vocational teachers of agriculture. Elective for others. Not for juniors or seniors in Poultry Science. Poultry Disease problems, nutritional problems, judging methods. Mr. Dearstyne.

Poul. 332. Preparation and Grading of Poultry Products. 0-3-0

Prerequisite: Poul. 101.

Commercial fattening; grading and marketing eggs; refrigerating and storage; markets. Mr. Williams.

Poul. 342. Turkey Production. 0-3-0

Prerequisites: Poul. 101.

Selection and mating; incubation: brooding poults; nutrition; grading and marketing. Mr. Nesbit.

Courses for Advanced Undergraduates

Poul. 401, 402. Poultry Diseases. 0-4-4

Prerequisites: Poul. 101, Zool. 102, Poul. 401 prerequisite to Poul. 402.

Sanitation, parasitic infestations and control, contagious and noncontagious diseases. Laboratory Diagnosis. Mr. Dearstyne.

Poul. 403. Sero-Diagnosis in Poultry Diseases. 0-0-3

Prerequisites: Poul. 401, 402; Bot. 312.

Basic immunological theory and technique; its application in the therapy and diagnosis of poultry disease. Mr. Greaves.

Poul. 412. Commercial Poultry Production. 0-0-3

Prerequisite: Poul. 101.

Development and maintenance of a commercial plant; custom hatching, and commercial incubation; cost of production. Mr. Kelly.

Poul. 413. Poultry Breeding. 0-3-0

Prerequisites: Poul. 101, Genetics, Zool. 411.

Methods of recognition and selection for mating from both standard and utility standpoints; study of progeny performance. Mr. Glazener.

Poul. 415. Poultry Nutrition. 0-4-0

Prerequisites: Zool. 101, Chem. 203.

Protein, vitamin and mineral requirements for growth, egg production and reproduction. Methods of feeding and compounding poultry mashes.

Mr. Kelly.

Poul. 423. Poultry Seminar. 0-0-4

Prerequisites: junior and senior courses in Poultry Science.

Required of seniors in Poultry Science.

Required readings and reports of current problems in Poultry Science.

Staff.

Courses for Graduates Only

Poul. 501, 502, 503. Poultry Histology. 3-3-3

Prerequisites: Poul. 311, 312, 401, 402, Zool. 461.

General histology of the tissues, special histology of the various systems of the body. Technique. Mr............ .

Poul. 511, 512, 513. Poultry Pathology. 3-3-3

Prerequisite: Poultry Histology.

Microscopic study of the effects of various disease processes of the tissues, organs and systems of the body. Technique. Mr. . . . .

Poul. 521. Poultry Physiology. 3-0-0

Prerequisites: Poultry histology and pathology.

Emphasizing the effects of disease processes on normal physiology. Mr. . . . .

Poul. 531, 532, 533. Poultry Research. 3-3-3

Prerequisite: Eighteen term credits in Poultry.

Problems in Poultry nutrition, diseases, marketing, and breeding to be conducted as definitely outlined by the Department. Staff.

Poul. 541, 542, 543. Graduate Seminar. 3-3-3

Prerequisite: Eighteen credit hours in Poultry. Staff.

Poul. 551, 552, 553. Production Studies and Experiments. 3-3-3

Prerequisites: Poul. 201, 333, 401, 402.

Problems in poultry nutrition, and breeding, and in commercial poultry production and marketing. **Staff.**

PSYCHOLOGY

Courses for Undergraduates

Psychol. 200. Introduction to Psychology. 3 or 3 or 3

A study of the general characteristics and development of human behavior, emphasizing the problems of motivation, emotion, learning, and thinking. Staff.

Psychol. 201. Elementary Experimental Psychology. 0-3-0

Prerequisite: Psychology 200.

Introduction to experimental psychology. One lecture and two laboratory periods per week. Mr. Barkley.

Psychol. 302. Psychology of Personality and Adjustment. 3-3-0

Prerequisite: Psychology 200.

A study of the factors involved in the development of the normal personality, emphasizing the principal factors controlling human behavior and their relationship to adjustment mechanism. Mr. Moffie.

Psychol. 303, 304. Educational Psychology. 3-3-0

Required of students in Education; Psychology 303 must precede Psychology 304.

Applications of psychology to education; problems of learning, motivation, interests; the measurement of educational efficiency; mental hygiene.
Mr. Johnson.

Psychol. 337. Industrial Psychology I. 3 or 3 or 3

Prerequisite: Psychology 200.

The application of psychological principles to the problems of modern industry;.selection and placement of workers. Messrs. Moffie, Westberg.

Psychol. 338. Industrial Psychology II. 3 or 3 or 3

Prerequisites: Psychology 200, 337.

The application of psychological principles to the problems of modern industry; industrial learning, methods of work, monotony, fatigue, accidents, illumination, and morale of workers. Messrs. Moffie, Westberg.

Psychol. 390. Social Psychology. 0-0-3

Prerequisite: Psychology 200.

Social applications of psychology: social stimulation, response, and attitudes. Mr. Barkley.

Courses for Advanced Undergraduates and Graduates

Psychol. 411. Rural Social Psychology. 0-0-3

For description of this course, see Rural Sociology 421. Mr. Barkley.

Psychol. 430. Abnormal Psychology. 0-0-3

Prerequisites: Psychology 200, 302.

A study of the causes, symptomatic behavior, and treatment of the major personality disturbances, emphasis also placed on preventive mental hygiene methods. Mr. Moffie.

Psychol. 470, 471, 472. Psychodiagnostic Techniques. 3-3-3

Prerequisite: Six hours in Psychology.

Techniques of measuring intelligence, personality, aptitudes, and achievement. Practice in administration and interpretation of psychological tests.
Staff.

Psychol. 476. Psychology of Adolescence. 0-0-3

Prerequisites: Psychol. 303, 304, or six credits in Psychology.

Mental growth, social development, and interests of adolescent boys and girls. Messrs. Johnson, Moffie.

Psychol. 478. Individual Differences. 3-0-0

Prerequisite: Six hours in Psychology.

Nature, extent, and practical implications of individual differences and individual variation. Mr. Barkley.

Courses for Graduates Only

Psychology 504. Applied Experimental Psychology. 0-0-3

Prerequisite: Twelve hours in Psychology.

Experimental analysis of problems of sensation, perception, learning, thinking, emotions, fatigue, and neuro-muscular reactions. Emphasis upon methods of experimental control, design of experimental apparatus, and accuracy of reports as these are related to laboratory investigations in the fields of applied psychology. Mr. Barkley.

Psychology 507. Advanced Industrial Psychology I. 3-0-0

Prerequisite: Twelve hours in Psychology.

Discussion, analysis and evaluation of psychological problems in industry; selection and placement of the worker. Emphasis on current research and study of psychological programs operating in different industries.

Messrs. Moffie, Westberg.

Psychology 508. Advanced Industrial Psychology II. 0-3-0

Prerequisite: Twelve hours in Psychology.

Discussion, analysis and evaluation of psychological problems in industry; training, morale, attitudes, fatigue, accidents, and maladjusted workers. Emphasis on current research and study of psychological programs operating in different industries. Messrs. Moffie, Westberg.

Psychol. 512, 513, 514. Problems in Applied Psychology. 3-3-3

Prerequisite: Twelve hours in Psychology.

Individual and group research problems in educational, industrial, and social psychology. Staff.

RURAL SOCIOLOGY

Courses for Undergraduates

Rural Soc. 201. Social Problems of Rural Life. 3 or 3 or 3

Nature of rural society; family; community; farm labor; population trends; standards of living; land tenure; rural-urban differences; institutions and organizations; cooperation; housing; health and medical care; recreation and cultural activities; social security; international aspects; social planning for a better rural life. Staff.

Rural Soc. 301. Community Organization. 3-0-0

Community Organization in North Carolina and other states; structure and size; institutions and service agencies; disorganization; techniques and methods of organization; leadership and the relation of organizations to State and National agencies. Mr. Wilkening.

Rural Soc. 312. Farmers' Movements. 0-3-0

The origin, growth, and the present status of such national farmers' organizations and movements as: The Grange, the Farmers' Alliance, the Populist Revolt, the Agricultural Wheel, the Farmers' Union, the Society of the Equity, the Nonpartisan League, the Farm Bureau, the Farm-Labor Union, the Cooperative Marketing Movement. Mr. Seegers.

Rural Soc. 323. Rural Leadership. 0-0-3

A social and psychological approach to rural leadership; the role of the leader in the community; characteristics of the successful leader; and techniques of leadership in rural life. Mr. Wilkening.

Courses for Graduates and Advanced Undergraduates

Rural Soc. 411. Rural Population Problems. 3-0-0

The number and distribution in relation to natural resources; physical and demographic characteristics; marriage rates; natural increase; migration; morbidity; mortality; occupations; rural-urban comparisons; trends; and national policies. Mr. Wilkening.

Rural Soc. 412. Rural Family Living. 0-3-0

Theories, problems, and surveys of rural standards and conditions of living. Forces and programs affecting present day standards. Mr. Hamilton.

Rural Soc. 421. Rural Social Psychology. 0-0-3

Characteristic mental traits and attitudes of rural people in relation to social organization and social change. Mr. Grinsted.

Rural Soc. 422. Social Aspects of Land Tenure. 3-0-0

Character and history of different types of land tenure; origins and growth of farm tenancy in the United States; social correlatives of land tenure; landlord-tenant relationships; farm leases; problem of ownership; farm mortgages; reform programs. Mr. Hamilton.

Rural Soc. 432. Social Security of Rural People. 0-3-0

Origin, extent, and character of rural poverty; types and extent of relief; problems of prevention; public policies and programs. Mr. Mayo.

Rural Soc. 441. Rural Social Pathology. 3-0-0
Problems of the individual arising out of the failure to adjust in society: such as juvenile deliquency, crime and mental disorders. Problems of family and community disorganization; and economic maladjustments. Mr. Mayo.

Rural Soc. 451, 452. Statistical Analysis of Social Data. 0-3-3
Applications of statistical theory to studies in fields of sociology, population, psychology, and education. Emphasis on techniques of sampling, analysis of variance, multiple correlation, probability, and curve fitting.
Mr. Hamilton.

Courses for Graduates Only

Rural Soc. 532. The Rural Family. 0-3-0
Historical forms and functions of rural family life; family activities and relationships; stages of family growth; the family-sized farm; effects of technical and economic changes on the rural family; national policies.
Mr. Wilkening.

Rural Soc. 533. The Rural Community. 0-0-3
Human ecology; types of communities; historical trends; economic, cultural and psychological factors; solidarity and disorganization; special interest groups; service agencies; state and national relations; "Utopian" experiments; planning. Mr. Mayo.

Rural Soc. 541, 542, 543. Research in Rural Sociology. 3-3-3
Objectives of reasearch; the scientific method; planning; organization, and direction of rural studies; preparation of schedules, interviewing, editing, tabulation, and analysis; field experience; preparation of research reports.
Credit for 543 involves at least 6 weeks' field and laboratory experience.
Staff.

Rural Soc. 553. Theory and Development of Rural Sociology. 3-0-0
History of the field; theories and contributions of leading sociologists; critical review of current literature; preparation of outlines on specific subjects. Mr. Hamilton.

SOCIOLOGY

Courses for Undergraduates

Soc. 101, 102, 103. Human Relations. 2-2-2
Designed for students who do not take Military Science. Elective for others.
An orientation course to introduce the student to the social problems of our time. Staff.

Soc. 202. Introductory Sociology. 3 or 3 or 3

The basic principles underlying social life and the factors connected with it. (Identical with the first term of General Sociology.)

Staff.

Soc. 202, 203. General Sociology. 3-3-0

First term: an analysis of the fundamental factors affecting life in modern society; second term: practical social problems, using the tools developed in the first term. Staff.

Soc. 210. General Anthropology. 3 credits

An introduction to the study of man: a consideration of his development from earliest forms to the present. Mr. Winston.

Soc. 301. Human Behavior. 3 credits

Prerequisite: Soc. 202.

An analysis of the social and cultural factors which affect the behavior of persons in their social life. Mr. Winston.

Courses for Graduates and Advanced Undergraduates

Soc. 400. Criminology. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Causes and conditions leading to crime; methods of handling criminals; various factors producing criminal behavior. Mr. Winston.

Soc. 401. Social Pathology. 0-0-3

Prerequisite: Soc. 202, supplemented by credits in related fields.

Pathological problems arising from social life; social and individual adjustments. Mr. Winston.

Soc. 402. Sociology of City Life. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Elective.

Problems arising from growth of modern town and city life; city planning in regard to social and industrial progress. Mr. Winston.

Soc. 403. Leadership. 3-0-0

Prerequisite: nine term credits in Sociology, including Sociology 202.

A study of leadership in various fields of American life: analysis of the various factors, inherent or acquired, that are associated with leadership, past and present. Mr. Winston.

Soc. Ex. 404. Educational Sociology. 3 credits

Prerequisite: nine term credits in the Social Sciences.

Application of the principles of Sociology to the practical problems of education with emphasis placed on the relation between adjustment processes in the school and in the larger social world. Mr. Winston.

Soc. 406. The American Family. **0-3-0**

Prerequisite: Soc. 202, supplemented by credits in related fields.

Premarital, marital, and family relations; effects of present-day social changes; various efforts to stabilize the family. Messrs. Winston, Hamilton.

Soc. 407. Race Relations. **3-0-0**

Prerequisite: Soc. 202, supplemented by credits in related fields.

Elective.

Race problems in America and in other countries; social, economic, and educational status of racial groups; international relations.

Mr. Winston.

Soc. 408. American Culture. 3 credits

Prerequisites: Soc. 202 or Soc. 210, supplemented by credits in related fields.

Analysis of present-day culture, with particular reference to the United States and its regional variations. Mr. Winston.

Soc. 410. Industrial Sociology. 0-0-3

Prerequisite: Soc. 202, supplemented by credits in related fields.

Influence of industrial life; occupations as social and industrial factors; problems arising from our industrial era. Mr. Winston.

Soc. 411. The American People. **3-0-0**

Prerequisite: Soc. 202, supplemented by credits in related fields.

Analyses of crucial problems connected with the growth and decline of populations in the United States; factors connected with birth and death rates; marriage rates; discussion of the changing quality of population groups. Mr. Winston.

Soc. 415, 416, 417. Research in Applied Sociology. **3-3-3**

Prerequisite: nine term credits in Sociology, and permission of the instructor.

Individual research problems in applied fields of sociology, such as problems of the family, of population, of social work; rural-urban relations; student success; American leadership. Mr. Winston.

SOILS (AGRONOMY)

Courses for Undergraduates

Soils 202. Soils. **0-5 or 5**

Prerequisites: Geol. 120 and Chem. 101 or 201.

The makeup, origin and classification of soils; the soil as a medium for plant growth. Mr. Lutz.

Soils 301. Soil Fertility and Fertilizers. **5-0-0**

Prerequisite: Soils 202.

Sources, manufacture, and utilization of fertilizer materials and mixed fertilizers; practical and soil management for North Carolina soils and cropping systems. Mr. Collins.

Soils 312. Soil Classification. **0-3-0**

Prerequisite: Soils 202.

The origin, characteristics, and classification of North Carolina soils; field trips. Mr. Lee.

Courses for Advanced Undergraduates and Graduates

Soils 401. Soil Fertility Evaluation. **3-0-0**

Prerequisites: Soils 301 and Chem. 212.

Analysis for total and available elements in the soil; the use of soil and plant analyses in soil diagnosis. Mr. Reed.

Soils 403. Soil Conservation. **0-0-3**

Prerequisite: Soils 202.

Factors affecting soil deterioration; soil conservation and land use. Messrs. Lutz, Lee.

Soils 412. Soil Chemistry. **0-4-0**

Prerequisites: Soils 301 and Chem. 212.

Chemical composition and properties of soil, particularly concerning soil acidity, absorption and exchange properties; the relation of chemical properties of soils to plant nutrition. Mr. Reed

Soils 421. Soil Physics. **4-0-0**

Prerequisites: Soils 202 and Phys. 201.

Physical constitution and analyses; structure, water relations, soil, air and temperature in relation to plant nutrition. Mr. Lutz.

Soils 443. Soil Microbiology. 0-0-3

See Botany 443. Mr. Shunk.

Soils 491, 492, 493. Special Problems. 3-3-3

Prerequisite: Admitted only with consent of the instructor.

Problems involving special library, laboratory or field studies of soils. Staff.

Courses for Graduates Only

Soils 501. Soil Development. 3-0-0

Prerequisites: Graduate standing in Soils.

Genesis, morphology, and development of the great soil groups of the world. Mr. Lutz.

Soils 503. Advanced Soil Fertility. 0-0-3

Prerequisite: Soils 301.

Soil conditions affecting crop growth; the chemistry of soil and plant interrelationships; theoretical and applied aspects of fertilizer usage in relation to plant nutrition. Mr. Cummings.

Soils 513. Physical and Colloidal Chemistry of Soils. 0-0-5

Prerequisite: Graduate standing.

The origin and nature of inorganic and organic soil colloids. The application of principles of physical and colloidal chemistry to soils problems. Current literature in soil chemistry. Mr. Reed.

Soils 522. Advanced Soil Physics. 0-5-0

Prerequisites: Soils 421 and graduate standing.

Physical properties of soils and special techniques. Current literature in soil physics. Mr. Lutz.

Soils 531. Seminar. One credit per term

Prerequisite: Graduate standing in Soils.

Reports and discussion of problems in Soil Science.

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate. Staff.

Soils 541. Soils Research. Credits by arrangement

Prerequisite: Graduate standing in Soils.

Research in specialized phases of Soil Science.

A maximum of nine credits is allowed toward the Master's degree but any number toward the Doctorate. Staff.

STATISTICS (Experimental Statistics)

Stat. 301, 302. Statistical Laboratory. 1-1-0

Prerequisite or co-requisite: Stat. 311.

Use of calculating machines and International Business Machine equipment. Preparation of charts and graphs from large masses of data, computations of various types of averages, computations from frequency distributions, adaptation of machine methods to the techniques of analysis of variance and regression. Mr. Monroe.

Stat. 311, 312, 313. General Statistics. 3-3-3

Statistics in everyday life; Statistics in research; collection, tabulation, and presentation of survey and experimental data; preparation of graphs, charts and tables; frequency distributions; concepts in elementary probability; computation of means and variances; tests of significance; introduction to correlation and linear regression; measurement of attributes; comparing observed and theoretical frequencies; index numbers; economic time series. Messrs. Monroe, Anderson.

Stat. 361. Introduction to Industrial Statistics. 3-0-0

Prerequisites: College algebra and an elementary science course.

A survey of applications of statistics in manufacturing, engineering and the physical sciences. Basic methods of statistics in quality control.
Mr. Peach.

Stat. 362, 363. Elementary Industrial Statistics. 0-3-3

Prerequisite: Statistics 361.

Control of quality of manufactured articles through control charts. The charts for p or np, c, x and R. Use of inspection tables. Consumer's and producer's risks. The operating characteristic of an inspection plan. Introduction to single, double and sequential sampling and to significance testing. Mr. Peach.

Courses for Graduates and Advanced Undergraduates

Stat. 412, 413. Experimental Statistics. 5-5-0

Applications of various statistical techniques in the analysis and interpretation of experimental data. Tests of significance by means of x^2 and t, confidence limits, sampling techniques, paired and unpaired group comparisons, linear regression and correlation, analysis of variance and covariance, multiple regression and covariance, curvilinear regression, single degrees of freedom. Messrs. Rigney, Monroe.

Stat. 421, 422, 423. Applied Mathematical Statistics. 3-3-3

Prerequisite: Math. 303.

Laws of probability; frequency distributions—normal, binomial, Poisson, multivariate; moments, sampling distributions, joint distributions; theory of least squares—regression and analysis of variance; theory of estimation —maximum likelihood; tests of significance—power functions.

Mr. Anderson.

Stat. 431. Design of Experiments 0-0-3

Prerequisite: Stat. 413.

Fundamental principles of designs; randomized blocks and Latin squares; individual comparisons, experimental and sampling errors, components of error, confounding; factorial, split-plot, and incomplete block designs. Designs for specific research problems. Miss Cox.

Stat. 443. Statistical Analyses of Economic Data. 0-0-3

Prerequisites: Stat. 413 and 312 or the equivalent.

Applications of statistical techniques to economic data. Probability; frequency distributions—normal, binomial, Poisson; review of averages, variability and tests of significance; components of variance; regression theory —multiple regression and orthogonal polynomials; index numbers; time series analysis; sampling techniques. Mr. Anderson.

Stat. 451, 452. Statistical Analysis of Social Data. 0-3-3

Prerequisite: Stat. 412.

Sampling social data, rural surveys and testing methods, analysis of variance and relationships; population studies. Application to problems in the fields of sociology, psychology and education. Mr. Hamilton.

Stat. 461, 462, 463. Intermediate Industrial Statistics. 3-3-3

Prerequisites: Math. 303, Chem. 103, Physics 203, and an elementary course in statistics (or equivalents). Probability and advance calculus are desirable.

Applications of probability to engineering and scientific problems. Theory of industrial sampling and inspection, with special attention to the problem of minimizing total cost. Statistical interpretation of tolerances and specifications, and reliability of scientific measurements. Introduction to design of experiments, and tests of differences of means and variances.

Mr. Peach.

Courses for Graduates Only

Stat. 511, 512, 513. Special Problems. 1-3, 1-3, 1-3

Development of techniques for specialized cases, particularly in connection with thesis problems. Staff.

Stat. 515. Research Method in Plant Science. 3-0-0

Prerequisite: Stat. 413.

Techniques of establishing and maintaining field and greenhouse experiments, size, shape and orientation of plots, border effects, estimation of experimental material required for specified accuracy, subsampling plots for yields and laboratory analyses. Mr. Rigney.

Stat. 521. Research Method in Animal Science. 3-0-0

Prerequisite: Stat. 431.

Sources of errors in experiments with animals, experimental designs adapted for specific types of animal research, estimation of data required for specified accuracy, factors involved in the increase of accuracy at minimum cost. Mr. Lucas.

Stat. 525. Statistical Concepts in Genetics. 0-3-0

Prerequisite: Stat. 412 and Zool. 411.

The composition of phenotypic variance and the estimation of environmental, genetic, and heritable genetic variance. Coefficients of inbreeding and relationship. The effects of various selection procedures and systems of breeding on population means and variances. Mr. Comstock.

Stat. 531. Sample Survey Techniques. 0-0-3

Prerequisite: Stat. 413.

Elementary theory of sampling from a finite population. General principles in sample design. Size of sample needed. Choice of sampling unit. Subsampling. Random, stratified, quota, purposive and systematic samples. Principles for the optimum distribution of samples amongst strata. Double sampling. Relative efficiencies of different methods of estimation. Administrative problems. Discussion of sampling methods in current use.

Mr. Cochran.

Stat. 542. Experimental Designs. 0-3-0

Prerequisite: Stat. 431.

Confounding, quasi-factorial, incomplete blocks and lattice square designs. Survey of types of designs available for pasture, field, greenhouse, animal and human experiments. Long time and groups of experiments.

Miss Cox.

Stat. 545, 546, 547. Advanced Industrial Statistics. 3-3-3

Prerequisites: Stat. 463 or equivalent, advanced calculus, matrix algebra (calculus or matrices may be taken concurrently)

Applications of correlation and regression to problems in engineering and science, with stress on efficient methods of computation. Analysis of variance and tests for homogeneity of purchased material. Design of experiments (randomized blocks, Latin squares, factorial and incomplete block designs) in factory "trouble shooting" and industrial sampling. Recent discoveries. Mr. Peach.

Stat. 552, 553. Econometric Methods. 0-3-3

Prerequisite: Math. 303 (Calculus).

Mathematical formulation and exposition of demand, laws of production, monopoly and taxation, random element, seasonal and cyclical variations; trend, orthogonal polynomials and correlation of time series.

Mr. Anderson.

Stat. 562. Psychometric Methods. 0-3-0

Prerequisite: Stat. 413.

Rating scales; mental-test methods; item and factor analysis; standard partial regression coefficients and functional relationships.

Stat. 571, 572, 573. Advanced Mathematical Statistics. 3-3-3

Prerequisite: Stat. 423.

Theory of errors, maximum likelihood, estimation, least squares and distribution theory.

Stat. 575, 576. Advanced Experimental Statistics. 3-3-0

Prerequisite: Stat. 413 or 423.

General principles in the construction of a mathematical model for the analysis of data. Effects of inadequacies in the model. More complex applications of chi-square, regression theory and analysis of variance and covariance. Transformation of data before analysis. Estimation of components of variance. Discriminant-function analysis and other recently-discovered techniques. Mr. Cochran.

Stat. 581, 582, 583. Seminar. 1-1-1

Staff.

Stat. 591, 592, 593. Research. 3-3-3

Staff.

SCHOOL OF TEXTILES

Description of Courses

Courses for Undergraduates

Tex. 108. Textile Principles. 3-0-0 or 0-3-0

This course is an introduction to textile manufacturing. It covers briefly the processes common to yarn manufacturing, and in a broader sense the types of mechanisms common to all textile machines, calculations involving speeds, productions, and twists that are associated with these mechanisms, and the theory and application of the cotton numbering system. The lecture and recitation work are suplemented by laboratory application, which covers in detail the work of the classroom. Messrs. Grover, Thomason, Biggers.

Tex. 131. Cloth Calculations. 3 or 3 or 3

Required of freshmen in all Textile curricula.

Systems of numbering woolen, worsted, silk, linen, rayon and cotton yarns; harness, reed and fabric calculations; loom production problems; operation of plain, twill and sateen looms. Messrs. Porter, Moser.

Tex. 203. Textile Yarns. 0-0-3

Required of sophomores in Textile Chemistry and Dyeing.

A condensed study of the processing of spun yarns, with emphasis on the characteristics of spun yarn and the packaging of the yarn for dye work. Class-room and laboratory studies. Messrs. Thomason and Biggers.

Tex. 206. Yarn Manufacture II. 0-0-4 or 0-4-0

Prerequisite: Tex. 108.

Required of sophomores in Textile Manufacturing.

Combined lecture and laboratory instruction on the functions involved in processing textile fibers on the cotton system from the raw product to the spun yarn. Particular emphasis is given to a study of the functions of opening, cleaning, doubling, evening, and drafting.

Messrs. Grover, Thomason, Biggers.

Tex. 217. Survey of Textile Industries. 0-0-3

Required of students majoring in Industrial and Rural Recreation.

A broad description of the manufacturing processes common to spinning, weaving, throwing, knitting and finishing with special emphasis placed on the orientation of personnel within these plants. Lectures will be supplemented with tours of school laboratory and specialized visual aids. Mr. Dunlap.

Tex. 233. Power Weaving Laboratory. 2 or 2 or 2

Required of sophomores in Textile Manufacturing.

Operation of automatic, drop-box and dobby looms; pattern chain building for drop-box and dobby looms. Messrs. Porter, Moser.

Tex. 234. Power Weaving. 2-0-0 or 0-2-0

Required of sophomores in Textile Manufacturing.

Construction of auxiliary motions on plain looms; cams and their construction; drop-box loom construction; methods of pattern chain building, construction and value of pattern multipliers; timing of drop-box motion and other motions. Messrs. Nelson, Porter.

Tex. 237. Fabric Structure. 2 or 2 or 2

Required of sophomores in Textile Manufacturing.

Plain, twill and sateen weaves; ornamentation of plain weaves, plain and fancy basket weaves; warp and filling rib weaves; drawing-in-drafts and chain plans; broken, curved fancy and various degree twills; color effects. Messrs. Porter, Moser.

Tex. 261. Knitting I. 2 or 2 or 2

Tex. 267, 268, 269. Knitting Laboratory I. 1-1-1

Required of sophomores in Textile Manufacturing. Tex. 267 and 261, only, are required of sophomores in Textile Chemistry and Dyeing. Selection and preparation of knitting yarns, knitting mechanisms, structure of selected types of spring and latch needle fabrics; operation and adjustment of the basic types of knitting machines. Messrs. Shinn, Lewis, Johnson.

Tex. 307, 308. Yarn Manufacture III. 3-0-3 or 0-3-3 or 3-3-0

Prerequisite: Tex. 206.

Required of juniors in Textile Manufacturing.

A continuation of Y. M. II on the functions of twisting and packaging of cotton rovings and yarns, with laboratory work supplementing lecture instruction. Also included is a study of textile machines as producing units—such machines as combers, roving frames, twisters, and the like. Messrs. Grover, Hilton, Thomason, Biggers.

Tex. 316. Textile Testing I. 0-2-0 or 0-0-2

Required of juniors in Textile Manufacturing.

Quality control methods for textile processing, with emphasis on the measurement by laboratory instruments and techniques, and including a study of the mechanical and natural influences involved. Messrs. Grover, Bogdan.

Tex. 335, 336. Dobby Weaving. 0-3-3

Prerequisites: Power Weaving and Power Weaving Laboratory, Tex. 233, 234.

Required of juniors in Textile Manufacturing.

Methods of drawing-in and starting up dobby warps; setting of harness shafts; selection of springs or spring jacks. Construction and setting of drop-box motions, single and double index dobbies and automatic mechanisms; methods of fixing looms.

Preparation of warps for weaving fabrics on dobby looms; starting up warps in looms; pattern chain building; operation of dobby looms. Mr. Hart.

Tex. 341, 342. Fabric Design and Analysis. 3-3-0 or 0-3-3

Prerequisite: Fabric Structure, Tex. 237.

Required of juniors in Textile Manufacturing.

Construction of fancy weaves, such as granite mock leno, checkerboard, honeycomb and diamonds; fabrics backed with warp or filling; fabrics ornamented with extra warp or extra filling; regular and fancy piques; methods of producing new designs.

Analyzing samples of fancy fabrics for design, drawing-in draft, reed plan and chain plan; calculations for reproducing fabrics when only a small sample is available. Messrs. Hart, Porter.

Tex. 345. Fabric Technology. 3-0-0 or 0-0-3

Prerequisite: Fabric Structure, Tex. 237.

Required of seniors in Weaving and Designing and General Textiles Options.

Calculations for contraction and factors which affect it; average yarn count; cloth constant, percentages of warp, filling and sizing; ascertaining the counts of warp and filling required for a given weight and construction; checking the correctness of any given yarn combination; obtaining spun counts from sized yarns; calculating yarn to be spun for a specific order; allocation of looms; loom speeds and production. Mr. Hart.

Tex. 371, 372. Knitted Fabric Design and Analysis. 2-2-0

Prerequisites: Tex. 267, 268, 269, 261.

Required of students in Knitting Option. Elective for others.

Stitch formation for the more intricate knitted fabrics; control mechanisms for pattern work; designing methods; analysis of fabrics for reproduction and costing; color in knit goods. Messrs. Shinn, Lewis.

Courses for Graduates and Advanced Undergraduates

Tex. 404. Synthetic Fiber Processing. 3-0-0

Prerequisite: Yarn Manufacture III.

Required of seniors in Yarn Manufacturing and Synthetics Options. Elective for others.

Special problems and manufacturing methods involved in processing cut rayon and other synthetic fibers from the raw product to the spun yarn, especially applied to the cotton system. Messrs. Grover, Thomason.

Tex. 407, 408. Yarn Manufacture IV. 3-3-0

Prerequisite: Yarn Manufacture III.

Required of seniors in Yarn Manufacturing and General Textiles Options. Elective for others.

Co-ordinated studies of the manufacture of yarn in the classroom and laboratory. Machine layout and sequence, draft limits, modern machines and processes, labor requirements, speeds, productions, and special related aspects are all combined to give an overall knowledge of yarn manufacture. Laboratory exercises involve processing from bale to packaged yarn.

Messrs. Grover, Hilton, Thomason.

Tex. 409. Textile Testing II. 2-0-0 or 0-0-2

Prerequisite: Textile Testing I, Tex. 316.

Elective.

Physical and associated chemical tests on fibers, yarns, and fabrics, including the natural and synthetic fibers. Specialized tests and techniques, such as abrasion tests, air and water permeability of fabrics, fiber fineness, and the like are covered. Solution and written reports of assigned technical problems. Messrs. Grover, Bogdan, and Technical Staff.

Tex. 415. Yarn Manufacturing Project. 0-0-3

Prerequisites: Tex. 307, 308 and Tex. 407.

Required of seniors in Yarn Manufacturing Option.

Setting up an assigned project, processing, testing and analysis of results, together with a written report on all phases is required.

Messrs. Hilton, Thomason, Grover.

Tex. 416. Wool Manufacture I. 3 or 3 or 3

Prerequisite: Yarn Manufacture II, Tex. 206.

Required of Seniors in Yarn Manufacturing and Synthetics Options. Elective for others.

Raw materials used in wool and worsted trades; classification, structure, and characteristics of fibers, grading, sorting and mixing. Reclaimed wool and secondary raw materials. Lectures are supplemented by laboratory applications. Mr. Hilton.

Tex. 420. Fiber Quality I. 0-3-0

History, development, production, ginning and handling of cotton. World crops; marketing methods; classification; relation of grade and staple to the value of cotton. Measurement of the physical properties of cotton fibers and their relation to spinning quality; relation of grade and staple to waste, spinning behavior, and yarn quality. Selection of cotton for different types of yarns and fabrics. Mr. Campbell.

Tex. 421. Fiber Quality II. 0-0-3

Introduction to synthetic fiber industry. Synthetic fiber development; types of synthetic fibers and their commercial importance; uses; properties of synthetic yarns and methods of determination. Processing methods required in mills engaged in synthetic textile production. Mr. Garden.

Tex. 424. Yarn Technology. 0-0-3 or 0-3-0

Prerequisites: Tex. 307, 308.

Required of seniors in Yarn Manufacturing and Synthetics Option. Elective for others.

A summary of the calculations involved in the production of yarn. The effect of staple, quality, twist, and fiber size and distribution on yarn characteristics. Novelty yarns. The technological aspects of blending different synthetics together or with natural fibers. Production of sewing thread.

Messrs. Hilton, Grover, Thomason.

Tex. 426, 427. Mill Organization. 0-3-3

Prerequisites: Yarn Manufacturing III, Fabric Design and Analysis, Weaving II.

Required of seniors in Textile Manufacturing.

Studies of organizations of textile mills from personnel as well as functional viewpoints and of the planning and scheduling of manufacturing contracts through opening and weaving mills. Analysis of manufacturing organizations based on processes and equipment.

Messrs. Grover, Thomason.

Tex. 435. Cotton, Wool and Rayon Weaving. 0-0-3

Prerequisites: Dobby Weaving, Tex. 335, 336.

Required of seniors in Weaving and Designing Option. Elective for others.

Principles of loom construction to weave rayon and fine cotton fabrics; pick and pick looms; box and multiplier chain-building; arrangement of colors in boxes to give easy running loom; extra appliances for weaving leno, towel, and other pile fabrics; relative speed of looms; production calculations and fabric costs. Weave room management. Mr. Nelson.

Tex. 437. Cotton, Wool and Rayon Weaving Laboratory I. 2 or 2-0

Prerequisites: Dobby Weaving, Tex. 335, 336.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

Operation and fixing of dobby, pick and pick, and jacquard looms; preparation of warps to weave rayon, wool and fine cotton fabrics; building of box, dobby and multiplier chains. Mr. Hart.

Tex. 438. Cotton, Wool and Rayon Weaving Laboratory II. 0-2-0 or 0-0-2

Prerequisites: Dobby Weaving, Tex. 335, 336.

Required of seniors in Weaving and Designing Option.

Continuation of Tex. 437 with special emphasis upon making original designs for dobby fabrics, preparing the warps and weaving the fabrics.

Mr. Hart.

Tex. 443. Dobby Design. 3-0-0

Prerequisites: Fabric Design and Analysis, Tex. 341, 342.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

Designing fabrics, such as fancy crepes, figured double plain, matelasse, velvets and corduroys; lines of samples. Leno weaves with one, two or more sets of doups. **Mr. Nelson.**

Tex. 444. Advanced Dobby Design. 0-3-0

Prerequisites: Dobby Design, Tex. 443.

Required of seniors in Weaving and Designing Option. Elective for others.

Combination of plain and fancy weaves with leno; methods of obtaining leno patterns; methods of making original designs for dress goods, draperies, etc. Mr. Nelson.

Tex. 445. Jacquard Design. 0-3-0

Prerequisites: Fabric Design and Analysis, Tex. 341, 342.

Required of seniors in Weaving and Designing Option. Elective for others.

Designing fancy and jacquard fabrics; methods of making original designs for table napkins, table colors, dress goods, draperies. Mr. Nelson.

Tex. 446. Jacquard Design and Weaving. 0-0-3

Prerequisites. Jacquard Design, Tex. 445.

Required of seniors in Weaving and Designing Option. Elective for others.

Construction and operation of single, double lift, and rise and fall jacquards; tie-up of harness for dress goods, table napkins, damask and other jacquard fabrics such as leno; card cutting lacing; making original jacquard designs. Mr. Nelson.

Tex. 451. Fabric Analysis. 2-0-0

Prerequisites: Fabric Design and Analysis, Tex. 341, 342.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

Analyzing samples of cotton, wool, worsted, linen, rayon, and silk fabrics for size of yarns, ends and picks per inch, weight of warp and filling, so as to accurately reproduce samples analyzed; obtaining design, drawing in draft, chain, and reed plan for fancy fabrics, such as stripes, checks, extra warp and extra filling figures, leno fabrics, jacquard fabrics, draperies.
Mr. Nelson.

Tex. 455. Color in Woven Design. 3-0-0

Prerequisites: Fabric Design and Analysis, Tex. 341, 342.

Required of seniors in Weaving and Designing Option. Elective for other.

Pigment and light theories of color; contrast and harmony of colors; factors which influence quality, style, and color; methods of applying weaves and color to fabrics for wearing apparel and home decorations. Mr. Hart.

Tex. 460. Knitting Mechanics. 0-0-3

Prerequisites: Tex. 261, 267, 268, 269.

Mathematics and mechanics of flat and rib knitting.

Inter-relation of yarn number, yarn diameter, gauge, cut, stitch, length, fabric structure, and weight; proportions of yarns in multiple-thread work; production problems, etc. Mr. Shinn.

Tex. 468. Flat Knitting. 3-0-0

Prerequisites: Tex. 361, 362.

Required of seniors in Knitting Option. Elective for others.

A study of the leading types of flat knitting machines including warp knitting machines, design possibilities, and fabric adaptability.

Messrs. Shinn, Johnson.

Tex. 469. Knitted Garment Manufacture. 0-0-3

Tex. 463, 464, 465. Knitting Laboratory II. 2-2-2

Prerequisites: Tex. 267, 268, 269, 261.

Required of students in Knitting Option. Elective for others.

A study of circular latch needle and spring needle machines for knit fabric production; styling, cutting and seaming of the basic garment types for underwear and outerwear; standard seam types; high-speed sewing machines. Messrs. Shinn, Lewis.

Tex. 471. Full-fashioned Hosiery Manufacture. 0-0-2

Tex. 473, 474, 475. Knitting Laboratory III. 2-2-2

Required of seniors in Knitting Option. Elective for others.

Mechanics of the full-fashioned hosiery machine including practical training in its adjustment and operation. Attention is given to yarn preparation, knitting, inspection, finishing and packaging hosiery.

Messrs. Lewis, Johnson.

Tex. 475. Textile Cost Methods. 0-3-0

Prerequisites: Tex. 307, 308, 341, 342.

Required of seniors, in Textile Manufacturing except those in Management Option.

A survey of cost methods applicable to textile mills with emphasis on calculations, the preparation of cost reports, and their use in cost control.

Mr. Shinn.

Tex. 477. Hosiery Manufacture. 3-0-0 or 0-3-0

Prerequisites: Tex. 267, 268, 269, 261.

Required of juniors in Textile Manufacturing.

A study of advanced types of circular knitting machines and the problems involved in the manufacture of the more complex types of hosiery. Hosiery design and analysis. Messrs. Shinn, Johnson.

Synthetics I, Tex. 490. 3 or 3 or 3

Storage and handling of synthetic yarns; preparation for weaving; single and ply twisting; weaving requirements of synthetic yarns, and the preparation for filling purposes. Inspection and grading of woven fabrics. Processing of synthetic yarns for tricot warp knitting. Synthetic yarn fabric styling and merchandising. Mr. Garden.

Synthetics II, Tex. 491, 492, 493. 3-3-3

Advanced study of synthetic yarn properties and handling methods. Comprehensive study of sized and unsized warp preparation, twisting, weaving, filling yarn preparation, cloth grading, tricot warp preparation, and single and sizing for knitting purposes. Styling and merchandising of synthetic yarn end products. Mr. Garden.

Tex. 499. Instrumentation and Control. 3 or 3 or 3

A lecture series with coordinated laboratory exercises designed to familiarize the student with the theory and application of instruments and control apparatus that he will find in the modern textile plant.

The studies cover the measurement and control of temperature, humidity, regain, chemical processes, physical finishing processes, time and temperature cycles, yarn and cloth tension, speed, and fluid pressure. Mr. Asbill.

Courses for Graduates Only

Tex. 501, 502, 503. Yarn Manufacture. 3-3-3

Prerequisites: Yarn Manufacture IV, Tex. 415 or equivalent.

A study of breaking strength and related properties of cotton yarns made under various atmospheric conditions; comparison of yarns produced from long and short-staple cotton with regular and special carding processes; efficiency of various roller covering materials at the drawing processes; elimination of roving processes by special methods of preparation; comparison of regular and long-draft spinning. Messrs. Grover, Hilton.

Tex. 505, 506, 507. Textile Research. 3-3-3

Problems of specific interest to the textile industry will be assigned for study and investigation. The use of experimental methods will be emphasized. Attention will be given to the preparation of reports for publication. The master's thesis may be based upon the data obtained. Staff.

Tex. 531, 532, 533. Textile Design and Weaving. 3-3-3

Prerequisites: Dobby and Jacquard Design, Tex. 443, 444, 445 or equivalent.

Study and practice in more advanced designing and analysis of fabrics, such as lenos made with twine and wire doups, lappits, and other fancy fabrics; designing for jacquard dress goods, table covers, reversibles, and other fabrics; making original designs for dobby and jacquard fabrics; fabric costs; weaving fancy and jacquard fabrics.

Messrs. Nelson, Hart.

Tex. 535, 536, 537. Seminar. 1-1-1

Discussion of scientific articles of interest to textile industry; review and discussion of student papers and research problems. Textile Staff.

Tex. 561, 562, 563. Knitting Research. 3-3-3

Prerequisites: Graduate standing and 12 credits in knitting.

Problems of specific interest to the knitting industry will be assigned for study and investigation. The use of experimental methods will be emphasized. Attention will be given to the preparation of reports for publication. Staff.

TEXTILE CHEMISTRY AND DYEING

Courses for Undergraduates

TC301, 302, 303. Textile Dyeing. 3-3-3

Prerequisite: Chem. 103.

Required of all textile students except those majoring in textile chemistry and dyeing.

A comprehensive course covering: a brief survey of elementary organic chemistry pertaining to textiles; important aspects of textile chemistry, dyeing, printing, and finishing.

Two 1-hour lectures and 2 hours of laboratory work per week.

Mr. Hayes.

TC305, 306, 307. Textile Chemistry and Dyeing. 4-4-4

Prerequisite: Chem. 423.

Required of all students majoring in textile chemistry and dyeing.

A study of the chemistry of natural fibers; action of chemicals on fibers; methods and chemistry of scouring, bleaching, and mercerization; preparation of dyestuffs and their application to fibers.

Two 1-hour lectures and 4 hours of laboratory work per week.

Mr. Hayes.

TC311. Chemical Testing of Textiles. 2 or 2 or 2

Prerequisite: TC301 or Chem. 423.

Required of all textile students.

A course designed to acquaint the student with the chemical identification of fibers, the analysis of mixtures of fibers by chemical means, and the chemical methods of control used in the commercial processing of fibers. Testing procedures used to evaluate the durability of dyes and textiles finishing materials are also included.

Two 2-hour laboratory periods per week.

Messrs. Rutherford, Grimshaw, Hayes.

Courses for Graduates and Advanced Undergraduates

TC405, 406, 407. Advanced Dyeing. 4-4-4

Prerequisite: TC307.

Required of all students in Textile Chemistry and Dyeing.

Studies of color matching, money value, and color mixing; lectures and laboratory exercises on natural and synthetic fibers emphasizing the following: Effect on physical and chemical properties of scouring, bleaching and dyeing; chemical and stain identification; dyeing with all classes of dyes with laboratory and mill dyeing equipment; water for textile processing. Textile starches and sizing materials, dyeing assistants, lubricating oils, identification of dyes, fastness testing and stripping.

Two 1-hour lectures and one 4-hour laboratory per week.

Mr. Grimshaw.

TC410. Textile Microscopy. 2 or 2 or 2

Prerequisites: Tex. 420, 421. These courses may be taken concurrently. Required of all textile students.

Lectures, demonstrations and experiments in the use of the microscope; preparation of slides; fiber identification; examination of yarns and fabrics; wool quality determination. Fundamentals and applications of the polyarizing microscope. Photomicrography.

Two 2-hour laboratory periods per week. Mr. de la Rama.

TC411. Fabric Finishing. 4-0-0

Prerequisite: TC307.

Required of students in Textile Chemistry and Dyeing.

A study of the compounds used in the finishing of fabrics, and of the methods used in laboratory development and plant application of finishing compounds. Studies of the methods of evaluation of finishes are included in the laboratory work.

Two 1-hour lectures and one 4-hour laboratory period per week.

Mr. Rutherford.

TC414, 415. Textile Printing. 0-3-3

Prerequisite: TC307.

Required of students in Textile Chemistry and Dyeing.

Roller Printing: History. Preparation of Fabric. (Scouring. Bleaching.) Thickeners. Colors for Printing such as Vat, Indigosols, Rapidogens, Aridyes, etc. Printing machines. Drying, Ageing, Aftertreatments, Finishing. Screen Printing. Screen making. Screen designs. Print Tables. Thickeners. Types of Dyes. Printing Operation. Aging and aftertreatments. Demonstrations on laboratory scale.

Two 1-hour lectures and one 2-hour laboratory per week, in the winter term; one lecture and one 4-hour laboratory period per week in the spring term. Mr. Grimshaw.

TC420. Chemistry of Natural and Synthetic Fibers. 0-3-0

Prerequisite: TC307.

Required of students in Textile Chemistry and Dyeing.

A lecture course emphasizing: the relationship between the chemical structure and physical properties of fibers; the nature of the chemical reactions which produce degradation of fibers; the production of synthetic fibers.

Three 1-hour lectures per week. Mr. Rutherford.

Courses For Graduates Only

TC510. Advanced Textile Microscopy. 3 or 3 or 3

Prerequisite: TC410.

Elective.

Study of textile starches, fibers, fabrics. Preparation of permanent slides. Study of various mounting media; methods of cross-sectioning; reagents and stains. Applications of the polarizing microscopy. Photomicrography.

Mr. de la Rama.

TC505, 506, 507. Textile Dyeing. 3-3-3

Prerequisite: TC407.

The course consists of matching shades from standard and season color cards upon classes of materials which require skill in their dyeing, such as three-fibre, cotton-wool, and half-silk hosiery, woolens and worsteds with effect stripes, and cotton fabrics with woven figures or stripes of the different varieties of rayon; advanced work on chemical examination of materials used in dyeing and finishing. Mr. Grimshaw.

ZOOLOGY

Courses for Undergraduates

Zool. 101. General Zoology. 4 or 4-0

Animals with special reference to the morphology and physiology of vertebrates.

Messrs. Kulash, Mitchell, Brandt, Harkema, Grosch, Fulton, Wing.

Zool. 102. Economic Zoology. 0-4 or 4

Animals with special reference to the more important economic groups; designed to give the student a general knowledge of the animal kingdom.

Messrs. Mitchell, Brandt, Grosch, Wing.

Zool. 111. Elementary Wildlife Management. 1-0-0

A course designed to acquaint the student with the field of Wildlife Management and to outline the training requirements necessary for employment in this profession. Mr. Barkalow.

Zool. 113. Human Physiology. 0-0-3

Prerequisite: Zool. 101.

Human physiology with emphasis on topics which are of special interest to students of recreation. Mr. Evers.

Courses for Advanced Undergraduates

Zool. 201. Animal Physiology. 5-0 or 5

Prerequisites: Zool. 101, Phys. 115, Chem. 201, 202, 203.

Comparative physiology of vertebrates, with particular reference to mammals and man. Detailed studies of various functions, with metabolism emphasized. Mr. Evers.

Zool. 213. Economic Entomology. 4 or 4 or 4

Prerequisite: Zool. 102.

The insects, including their economic importance and the principles of control. Messrs. Mitchell, Wing, Kulash.

Zool. 223. Comparative Anatomy. 0-0-5

Prerequisites: Zool. 101, 102.

Comparative morphology of vertebrates. Interrelations of organ systems studied for the various groups. Mr. Harkema.

Zool. 241, 243. Beekeeping. 3-0-3

Prerequisite: Zool. 102.

Scientific beekeeping and honey marketing.

Zool. 251, 252, 253. Ornithology. 2-2-2

Prerequisites: Zool. 101, 102.

Biology and morphology of North American birds. Mr. Metcalf.

Zool. 302. Forest Entomology. 0-3-0

Prerequisite: Zool. 213.

Forest insects, including the factors governing abundance, and the application of this knowledge in control. Mr. Kulash.

Zool. 312. Principles of Game Management. 0-3 or 3

Elective for juniors and seniors not in Game Management.

Brief survey of the field, study of the major principles involved, and the correlation of wildlife management with other land uses.

Mr. Barkalow.

Zool. 321, 322, 323. Wildlife Conservation. 3-3-3

Prerequisites: Zool. 251, 252, 253, F. C. 202, Bot. 101, 102, 203.

History of game and wildlife management; relation of wildlife conservation to soil and forest conservation; national and state parks; general farming operations. Mr. Barkalow.

Zool. 332. Fur Resources. 0-3-0

Prerequisites: Zool. 321, 322, 323.

Life history and management of the important fur-bearing animals; skinning, drying, marketing pelts; fur farming. Mr. Barkalow.

Courses for Graduates and Advanced Undergraduates

Zool. 401, 402, 403. Applied Entomology. 3-3-3

Prerequisite: Zool. 213.

Crop and animal pests with emphasis on their identification; general principles of insect control and special study of contact insecticides, stomach poisons and fumigants; insecticide research methods. Mr. Fulton.

Zool. 411. Genetics. 5-0 or 5

Prerequisite: Bot. 101 or Zool. 101.

Basic principles of heredity and variation. Students conduct breeding experiments and study inheritance in various animals and plants.

Messrs. Bostian, Grosch.

Zool. 412. Advanced Genetics. 0-3-0

Prerequisite: Zool. 411.

Intended for students desiring more thorough and detailed training in fundamental genetics than provided by Zool. 411, with some attention to recent advances. Messrs. Bostian, Grosch.

Zool. 413. Advanced Physiology. 0-0-3

Prerequisites: Zool. 101, 102, 201.

Special studies in animal physiology with emphasis on fundamental processes involved. Lectures, reports, and conferences to promote an acquaintance with general literature and recent advances; selected exercises and demonstrations to develop experimental technique. Mr. Evers.

Zool. 421, 422, 423. Systematic Zoology. 3-3-3

Prerequisites: Zool. 101, 102.

The classification of insects or other groups of animals.

Messrs. Brandt, Mitchell.

Zool. 431. Field Zoology. 3-0-0

Prerequisites: Zool. 101 and 213, or 223.

The relation between animals and their environment. Frequent excursions to the field will be taken.

Zool. 442. Histology. 0-5-0

Prerequisites: Zool. 101, 102, 201, 223.

Animal tissues and their preparation. Mr. Harkema.

Zool. 443. Zoological Technique. 0-0-5

Prerequisites: Zool. 101, 102, 213.

Methods of preserving animals and illustrating papers. Staff.

Zool. 451, 452, 453. Wildlife Management. 3-3-3

Prerequisites: Zool. 251, 252, 253, F.C. 101, Bot. 101, 102, 203.

The fundamental principles of Wildlife Management are studied in the field and laboratory. Three field trips are taken during the year.

Mr. Barkalow.

Zool. 461. Vertebrate Embryology. 5-0-0

Prerequisites: Zool. 101, 102.

The comparative embryology of the principal groups of vertebrates, with special emphasis on the chick. Mr. Harkema.

Zool. 462, 463. Advanced Animal Ecology. 0-3-3

Prerequisite: Zool. 431.

Animal geography and the factors which influence the distribution of animals. Mr. Metcalf.

Zool. 471, 472, 473. Advanced Wildlife Management. 3-3-3

Prerequisites: Concurrently with or preceded by Zool. 321, 322, 323.

An assigned problem to be planned and worked out by the student. A term paper covering the procedure. Mr. Barkalow.

Zool. 481, 482, 483. Advanced Food Habits Problems. 3-3-3

Prerequisites: Concurrently with or preceded by Zool. 451, 452, 453.

Assigned or selected problem dealing with the foods and feeding habits of one species of wild animal or a group of similar wild animals.

Mr. Barkalow.

Zool. 491. Protozoology. 3-0-0

Prerequisites: Zoology 101, 102, 223.

The study of the morphology, biology, and control of the parasitic protozoa with emphasis on those infecting man. Mr.Harkema.

Zool. 492. Helminthology. 0-3-0

Prerequisite: Zoology 491.

The study of the morphology, biology, and control of the parasitic worms with emphasis on those infecting man. Mr. Harkema.

Zool. 493. Medical Entomology. 0-0-3

Prerequisite: Zoology 491.

The study of the morphology, biology, and control of mites, ticks, and the insects parasitising vertebrates. Mr. Harkema.

Courses for Graduates Only

Zool. 501, 502, 503. Systematic Entomology. 3-3-3

Prerequisites: Zool. 421, 422, 423.

Codes of nomenclature, methods of writing descriptions, constructing keys, determining priority, selecting and preserving types, and making bibliographies and indexes. Messrs. Metcalf, Mitchell.

Zool. 511, 512, 513, and Zool. 551, 552, 553. Research in Zoology. 3-3-3

Prerequisite: eighteen term credits in Zoology.

Problems in development, life history, morphology, physiology, ecology, genetics, game management, taxonomy, or parasitology.

Staff.

Zool. 521, 522, 523. Seminar. 1-1-1

Prerequisite: eighteen term credits in Zoology. Mr. Metcalf.

Zool. 531, 532. Biological Control of Insects. 3-3-0

Diseases, predators and parasites of insects; methods of rearing and disseminating for biological control. Messrs. Fulton, Smith.

Zool. 533. Advanced Genetics. 0-0-3

Prerequisites: Zool. 411, 412.

Special topics and recent advances, accomplished by lectures, references, conferences, and reports by students, each selecting one or more topics for special study. Messrs. Bostian, Grosch.

Zool. 541, 542. Insect Physiology. 3-3-0

Prerequisite: Zool. 201.

Mechanisms involved in the life processes of insects.

Zool. 543. Fruit Insects. 0-0-3

Prerequisite: Zool. 213 or equivalent.

The economic importance of insects attacking fruit or fruit trees; their characteristics, habits, ecology, and biology; with most practical control measures. Mr. Smith.

Zool. 551, 552, 553. Research in Zoology. 3-3-3

See Zool. 511, 512, 513. Staff.

Zool. 561, 562, 563. Insect Biology. 3-3-3

Life histories, including modes of reproduction, embryology, growth, metamorphosis, protection, food relations, hibernation, social relations, and adaptations. Mr. Mitchell.

Zool. 571, 572, 573. Insect Ecology and Behavior. 3-3-3

Natural activities of insects: feeding, protection, reproduction, reaction to environmental factors, interrelations, and distribution. Mr. Fulton.

Zool. 581, 582, 583. Insect Morphology. 3-3-3

The external and internal anatomy of insects and their near relatives. Mr. Metcalf.

Zool. 591. Immature Insects. 0-3-0

Prerequisites: Zool. 102 and 213 or equivalent.

Methods of collecting, preserving and determining immature insects. Mr. Smith.

V. SUMMARY OF ENROLLMENT

1947-48*

1. Resident Students		
A. Candidates for Degrees		
1. Freshmen	1,480	
2. Sophomores	2,204	
3. Juniors	731	
4. Seniors	888	
5. Graduates	237	
Total	5,540	5,540
B. Irregular Students		
†1. Extension Classes in Raleigh	269	
2. Special Students and Auditors	58	
Total	327	5,867
†2. Non-resident Students		
A. Correspondence Students for College Credit	1,417	
B. Correspondence Students in Practical Courses, no credit	4	
C. Extension Classes outside Raleigh	767	
Total	2,188	8,055
3. Summer School Students, 1947		
A. Regular Students (nine weeks term)	2,117	
B. Special Students and Auditors	25	
C. Surveying (two weeks)	126	
D. Forestry Camp (ten weeks)	55	
E. College Credit (9 weeks)	38	
F. Graduates—not classified	5	
Total	2,366	10,421
4 Short Courses and Special Conferences		
1. Dairy Production Short Course	15	
2. Dairy Fieldmen's Short Course	23	
3. Diesel Operation and Maintenance II	6	
4. Motor Vehicle Fleet Supervisors Training Course	70	
5. Diesel Operation and Maintenance I	18	
6. Ice Cream Making Short Course	20	
7. Market Milk Short Course	19	
8. Dairy Herd Improvement	5	
9. Short Course on Electrical Meters and Relays	95	
10. State Garden School	106	

* Does not include Spring Term 1947-48.
† Data from January 1, 1947 to January 1, 1948.

11. Short Course in Artificial Insemination of Cattle	12	
12. Cotton Classing Short Course	35	
13. Diesel Operation and Maintenance I	14	
14. Electric Refrigeration	18	
15. Industrial Electricity	9	
16. Waterworks School of 1947	93	
17. Frozen Food Locker Short Course	15	
18. Seedmen's Short Course	33	
19. Diesel Operation and Maintenance I	18	
20. High Point Garden School	130	
21. Retail Lumber Dealers Training Course	34	
22. Artificial Breeding Short Course	20	
23. Dairy Herd Testing	10	
24. Dairy Manufacturing Conference	120	
25. Mid-Southeastern Gas Association	171	
Total	1,109	11,530

ENROLLMENT BY CURRICULA*

Basic Division

(Freshmen and Sophomores)

Agriculture	767
Engineering	2,123
Teacher Education	233
Textiles	561
Total	3,684

School of Agriculture and Forestry

(Juniors, Seniors, Graduates)

Agricultural Options	248
Agricultural Chemistry	30
Agricultural Engineering	20
Forestry	55
Landscape Architecture	6
Wildlife Cons. and Mgt.	10
Total	369

School of Engineering

(Juniors, Seniors, Graduates)

Architectural	52
Architecture	24
Ceramic	39
Chemical	112
Civil	147
Diesel	14
Electrical	174
Engineering-General	123
General	31
Geological	7
Industrial	74
Mechanical	227
Mechanical, Aero. Opt.	44
Mechanical, Heat and Air	16
Total	1,084

Division of Teacher Education

(Juniors, Seniors, Graduates)

Agricultural Education	75
Industrial Arts Education	9
Industrial Education	1
Total	85

School of Textiles

(Juniors, Seniors, Graduates)

Knitting	23
Textile Chem. and Dyeing	44
Textile Management	89
Textile Manufacturing	128
Weaving and Designing	14
Yarn Manufacturing	1
Total	299

Nonclassified Auditors and Special Students	58

* * * *

Distribution of Graduate students by schools (included in above departmental classifications).

Agriculture	122
Engineering	79
Teacher Education	7
Textiles	11
Not Classified	18
Total	237

* Does not include Spring Term 1947-48.

FIFTY-EIGHTH ANNUAL COMMENCEMENT

June 9, 1947

DEGREES CONFERRED

SCHOOL OF AGRICULTURE AND FORESTRY

BACHELOR OF SCIENCE
IN AGRICULTURAL CHEMISTRY

Elbert Wright Brower . . . . . . Ivanhoe

IN AGRICULTURAL ECONOMICS

Clifford Eugene Berger . . . . . . Brooklyn, N. Y.
*John Marvin Curtis . . . . . . Franklinville
Hubert Alden Hardison . . . . . . Williamston
William Clarence Hinson, Jr. . . . . . . Walstonburg
**Maurice Jerome Pickler . . . . . . New London
Kester Andrew Sink . . . . . . Thomasville
*Moyle Strayhorn Williams . . . . . . Hillsboro

IN AGRICULTURAL ENGINEERING

John Colon Daughtridge . . . . . . Rocky Mount
Kenneth High Farmer . . . . . . Bailey
*James Malcolm Humphrey . . . . . . Shannon

IN AGRONOMY (FIELD CROPS)

Samuel David Alexander . . . . . . Matthews
Warren Harding Bailey . . . . . . Apex
*James Boyd Baucom . . . . . . Monroe
Richard Ralph Brake, Jr. . . . . . . Battleboro
Furman Otis Clark . . . . . . Inez
John Fletcher Fisler . . . . . . Ivanhoe
Gene Mitchell House . . . . . . Scotland Neck
*James Tillery Johnson . . . . . . Raleigh
Guy Langston Jones . . . . . . Kinston
*Harry Lea Jordan . . . . . . Clarkton
Roy Henry Lane . . . . . . Raleigh
Benjamin Irvin Mann . . . . . . Pendleton
Luther Gideon Sink, Jr. . . . . . . Lexington
John Walter Stallings . . . . . . Selma
William Chester Williford . . . . . . Elm City
James Alvin Wilson . . . . . . Scotland Neck

IN AGRONOMY (SOILS)

**Guy Baseler Baird . . . . . . Newland
Brutus Willard Barrett . . . . . . Macon
Ferdinand Clarence Stallings, Jr. . . . . . . Jamesville

* With Honors.
** With High Honors.

IN ANIMAL INDUSTRY

Alexander Brownlow Addington .... Franklin
Felix Francis Arnstein .... Fletcher
Arren Gray Ayers .... Fairmont
Eugene Caldwell Berryhill .... Paw Creek
Lewis Vardell Blake .... Watha
James Paul Bowles .... Hiddenite
Hassel Allen Byrd .... Burlington
Joe Corrace Cline .... Shelby
*Curtis Robinson Fincher .... Matthews
Ophus Martin Fulcher .... Leaksville
*Keith Edward Gregory .... Franklin
Curtis John Hobson .... Boonville
Abram Troy Lassiter, Jr. .... Clayton
*Frank Howard McDowell .... Clyde
*James Thomas Moss .... Youngsville
Cleveland Allen Partin .... Louisburg
James William Phillips .... Mebane
Robert Lamar Rabb .... Lenoir
Vernon Hughes Reynolds .... Kinston
Joseph Ernest Sanderson .... Four Oaks
*John Bruce Stinson .... Boonville
*Fred Homewood Wagoner .... Gibsonville
*John Bryan Wagoner .... Gibsonville
George Wayne Walker, Jr. .... Franklin
Daniel Richard Warren, Jr. .... Dunn
George Travis Wiggins .... Mt. Olive
George Vernon Woodard .... Spring Hope

IN DAIRY MANUFACTURING

Ralph Edwin Arbib .... New York, N. Y.
Robert Cecil Beeman .... Raleigh
Robert Oliver Brown .... Charlotte
Paul Reginald Jordan, Jr. .... Wilmington
Walter Forney Ramseur .... Morganton
Robert Franklin Robinson .... Gastonia
Sam Earl Westbrook .... Dunn

IN ENTOMOLOGY

Frederick DeHaven Morrison .... Sewickley, Pa.

IN EXPERIMENTAL STATISTICS

**Lyle David Calvin .... Wichita, Kansas

IN FORESTRY

William Jackson Barton .... Canton
Wilson Spratley Campbell .... Staunton, Va.

* With Honors.
** With High Honors.

Robert Dorsen . . . New Brunswick, N. J.
William James Ellis, Jr. . . . Philadelphia, Pa.
*Jay Hale Hardee . . . High Point
Joseph Franklin Hardee . . . Siler City
*Norman Hodul . . . New York, N. Y.
Douglas Thurman House . . . Beaufort
John Carlton Jones . . . Pittsboro
Henry Kaczynski . . . Trenton, N. J.
*Walter McClellan Keller . . . Washington, D. C.
Richard Daley Mahone . . . Williamsburg, Va.
Charles Evan Schreyer, Jr. . . . Mamaroneck, N. Y.
Stanley Glenn Spruiell . . . Leeds, Alabama
William Lacy Wharton, Jr. . . . Winston-Salem

IN HORTICULTURE

Paul Edward Bannerman . . . Carolina Beach
Roy Hobbs Byrd . . . Bunnlevel
Sim Glerand Honeycutt . . . Clinton
Otis Hackett Johnson, Jr. . . . Morehead
Benjamin Turner Leonard . . . Raleigh
Peyton Howard Massey, Jr. . . . Zebulon
George Stanley Rehder . . . Wilmington
Thomas Jennette Robbins . . . Burgaw
Walton Ray Thompson . . . Black Creek
John Allison Wilson . . . Louisburg

IN PLANT PATHOLOGY

*Robert Paul Scheffer . . . Newton
Stuart Louis Zeckendorf . . . Newark, N. J.

IN POULTRY SCIENCE

Paul Shepard Oliver, Jr. . . . Fairmont
Thorne Maxton Reynolds . . . Columbia

IN RURAL SOCIOLOGY

Charles Wilson Doak . . . Raleigh

IN WILDLIFE CONSERVATION AND MANAGEMENT

Titus Stuart Critcher . . . Williamston
Malcolm Grey Edwards . . . Asheville

SCHOOL OF ENGINEERING

BACHELOR OF ARCHITECTURAL ENGINEERING

William Joseph Boney . . . Wilmington
Joseph Robbin Flowers . . . Lumberton
*John Stephen Holloway . . . Raleigh
Wyllis Eugene James . . . Farmington

* With Honors.

*Harold Gray Lewis .... Morehead City
John Gorham Low, Jr. .... Burnsville
*Joseph Minter Payne .... Clayton
**Everett Gordon Spurling, Jr. .... Fallston
*Stephen Charles Wilber, Jr. .... Charlotte

BACHELOR OF CERAMIC ENGINEERING

Raymond Benbenek .... Jamestown, N. Y.
*Robert Eure Brickhouse, Jr. .... Warrenton
*John Jones Brown, Jr. .... Mount Airy
*Richard Dammann .... Amityville, N. Y.
*Francis Montgomery Steele .... Winston-Salem
John Graves Vann, Jr. .... Raleigh

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Walter Jarvis Adams, Jr. .... Asheville
*Arthur Alexander Armstrong, Jr. .... Gastonia
Joseph David Beam, Jr. .... Hamlet
Whit Taylor Benton, Jr. .... Wilmington
*Montgomery Herman Biggs, Jr. .... Rutherfordton
*Arthur Ferreira Cacella .... New Bedford, Mass.
Ernest Patrick Cain, Jr. .... Raleigh
William Allen Carr .... Farmville
Henry Faison Chesnutt .... Clinton
**Edgar Riley Cole .... Phoebus, Va.
**Eustace Robinson Conway, III .... Greenville
Walter Horton Corwin .... Ahoskie
*William Jeffress Daniel .... Henderson
James Edward Deas, Jr. .... Canton
Jackson Freeman Dunn .... Charlotte
Reuben Oscar Everett .... Greenville
Eugene Brooks Finch .... Zebulon
George Camp Fuller .... Gastonia
*Theodore Atkinson Hardaway .... Greenville
Grover Wilson Hedgecock .... Winston-Salem
John Robert Hosea .... Pikeville
*Alfred Burman Hurt, Jr. .... Nathans Creek
*Richard Bernard Isenhour .... Charlotte
Richard Miller Jones .... Salisbury
**George Kiopekly .... Raleigh
Ralph Glenroi Knight, Jr. .... Roanoke Rapids
Kenneth Pritchard Lapeyre .... Jacksonville, Fla.
John Cooper Lumsden .... Raleigh
Edward Patrick Lynch, Jr. .... Charlotte
*Robert Allen McAllister .... Indianapolis, Ind.
*Herbert Craig Miller, Jr. .... Mooresville
*Warren Turner Milloway .... Greensboro

* With Honors.
** With High Honors.

Charles Henderson Mims, Jr. .... Raleigh
Eugene Joseph Mogilnicki .... New Bedford, Mass.
*Jack Earl Norwood .... Raleigh
Robert Milton Phillips .... Charlotte
*George Anderson Rose, III .... Henderson
Harris George Strong .... Raleigh
Earl Roscoe Weatherly .... Columbia
Dewey Reece Winchester .... Monroe
David Ralph Wright, Jr. .... Wilkesboro

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John Robert Adams .... Greensboro
William Welch Boyer .... Arlington, Va.
Louis Alexander Brown, Jr. .... Charlotte
Hiram Thompson Chapin, Jr. .... Lillington
*Harry Patterson Clapp .... Greensboro
Charles Edwin Clarke, Jr. .... Kenly
Max Collins, Jr. .... Cary
Albert White Foster .... Raleigh
Charles Brooks Gates .... Roxboro
*Frank Richard Geluso .... Brooklyn, N. Y.
Thomas Price Heritage .... Burlington
*James Albert Highsmith, Jr. .... Greensboro
Thomas Ricaud Koonce, Jr. .... Fair Bluff
George Edward Langley .... Norfolk, Va.
William Bankhead Meredith, II .... Norfolk, Va.
*Charles Greenwood Miller, Jr. .... Warren, Ohio
Mack Thomas Miller .... North Wilkesboro
Forrest Becton Pully .... Kinston
Marshall Miller Rich .... Raleigh
Raymond Sydney Rollings .... Pinewood, S. C.
Floyd Stuart Seay, Jr. .... Reidsville

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**Alexander Denis Alexandrovich .... New York, N. Y.
*Robert Wilson Bivens .... Wingate
*Robert Anthony Boot .... Norristown, Pa.
John Foster Bryant, Jr. .... Raleigh
*Victor Dominic Caggiano .... Bronx, N. Y.
Roy Alton Campbell .... Albemarle
John Walter Chadwick, Jr. .... Rocky Mount
Eugene Barnette Dawson .... Raleigh
Carl Byrd Fisher .... Whittier
*William Cowell Flora, Jr. .... Moyock
**Henry Gilmore, Jr. .... Fairhaven, Mass.
*Charles Richard Greenhow .... Covington, Ky.
William Raleigh Harmon, Jr. .... North Wilkesboro

* With Honors.
** With High Honors.

*John Stuart Hunter .... Linden, N. J.
**Wilbur Gerald James .... Parmele
Fred Duncan Jerome, Jr. .... Pittsboro
Wesley Norwood Jones .... Raleigh
Stanley Kohler .... New York, N. Y.
Joseph Vann Lemmond .... Monroe
Charles Rufus McNair, Jr. .... Rockingham
*Espie Flynn Menius, Jr. .... New Bern
William Bradford Moore .... Milton
Preston Douglas Page .... Rowland
Jack Pinner .... Brooklyn, N. Y.
Roger Bailey Poole .... Greensboro
Charles Yancey Proffitt .... Burnsville
**Joseph Gray Reddeck .... Laurinburg
*Sherwood Skillman .... Oldwick, N. J.
James Right Stone, Jr. .... Durham
Edwin Franklin Troy, Jr. .... Wilmington
Isaac Norris Tull, Jr. .... Shaker Heights, Ohio
*James Roland Turbeville .... Atlanta, Ga.
Carl Hampton Walker, Jr. .... Bailey
George Sparrow Watkins .... Charlotte
*John Morehead Witherspoon .... Lexington
Thomas Fowler Woodside .... Charlotte
Charles Barkley Woolley, Jr. .... Charlotte
Joseph James Wynne .... Manchester, Mass.

BACHELOR OF SCIENCE IN GENERAL ENGINEERING

*Patrick Hill McDonald, Jr. .... Carthage
*George Washington Middleton .... Warsaw

BACHELOR OF GEOLOGICAL ENGINEERING

Roy Samuel Ingle .... Statesville

BACHELOR OF INDUSTRIAL ENGINEERING

John Monroe Council, Jr. .... Whiteville
*David Oscar Garrison, Jr. .... Norfolk, Va.
Frank Anthony Guba, Jr. .... Westfield, N. J.
Lewis Simms Hartzog .... Lexington
William Watkins Kearney, Jr. .... Rocky Mount
William Hugh Milloway .... Greensboro
*Fred Carl Phillips, Jr. .... Burlington
Gordon Harvey Pratt .... Arlington, Mass.

BACHELOR OF MECHANICAL ENGINEERING

Murry Abrams .... Far Rockaway, N. Y.
William Montfort Boylan .... New Bern
Henry Lacy Buffaloe .... Garner

* With Honors.
** With High Honors.

Gale Philip Clee . . . . . Asheville
George William Coble . . . . . Burlington
Clyde Alvin Dillon, Jr. . . . . . Raleigh
Richard Higgs Duncan . . . . . Greenville
*William Alexander Faison, Jr. . . . . . Chester, Pa.
Solomon Porter Fulk, Jr. . . . . . Winston-Salem
Joseph Grady Goldston, Jr. . . . . . High Point
George Robert Greene . . . . . Hendersonville
Walter Henry Haene . . . . . Concord
Ernest David Hawkins . . . . . Murphy
*Robert Wesley Holtzclaw, Jr. . . . . . Canton
Glenn Richard Hoover . . . . . Winston-Salem
Richard Olin Howard . . . . . Ocracoke
Samuel Henry Huffstetler . . . . . Haw River
James Garfield Johnson . . . . . Charlotte
Thomas Alexander Jones . . . . . Charlotte
Richard Wheeler Kennison, Jr. . . . . . Raleigh
David Nicholson Low . . . . . Burnsville
Arthur Matthews McCabe, Jr. . . . . . Raleigh
John Malcolm McDermott . . . . . Vass
Charles Haywood McLemore . . . . . Godwin
Earl William Main . . . . . Delanco, N. J.
Lawrence Thomas Mencke . . . . . Wilmette, Ill.
*John Ralph Metz . . . . . Saylesville, R. .I
Henry Young Miller . . . . . Brevard
*Joseph Masten Monroe . . . . . Hamlet
Jack Franklin Moore . . . . . Kannapolis
Charles John Paulus, III . . . . . Yeadon, Pa.
Glynn Elvin Poteet . . . . . Sylva
Robert E. Rector . . . . . Murphy
Edward Graham Sellers . . . . . Charlotte
Henry Howard Sherrill, Jr. . . . . . Winston-Salem
Richard Keith Shumaker . . . . . Raleigh
Davis Lee Simpson . . . . . Altamahaw
James Archibald Stokes, Jr. . . . . . Charlotte
Alvin Buford Watson . . . . . Fayetteville
*John Kerr Whitfield . . . . . Asheboro
*James Cecil Wilson, Jr. . . . . . Gastonia
*Floyd Chester Witten . . . . . Gastonia
Willis Lester Woodall . . . . . Smithfield

BACHELOR OF MECHANICAL ENGINEERING, AERONAUTICAL OPTION

Robert Erwyn Allison . . . . . Sylva
**William Marshall Bland, Jr. . . . . . Portsmouth, Va.
Maurice Beaty Dunn . . . . . Charlotte
*Carl Edward Grigsby . . . . . Hilton Village, Va.

* With Honors.
** With High Honors.

William Theodore Harkey .... Washington, D. C.
James Lafayette Hassell, Jr. .... Edenton
William Justice McCoy, Jr. .... Charlotte
*David Hill Michal .... Canton
John Allison Mills .... Cary
*Meade Harrison Mitchell, Jr. .... Weldon
John Elbert Park .... Charlotte
Grayden Muir Paul, II .... Beaufort
Frederick Walthour Peacock .... Asheville
Harry Watson Sloan .... Charlotte
Arthur Clifford Spruill, Jr. .... Goldsboro
Marion Kenchen Taylor .... Raleigh
*Homer Stion Tolan, Jr. .... Belhaven
Raymond Brooks Wood .... Tampa, Fla.

DIVISION OF TEACHER EDUCATION

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Richard Coltrane Adams .... Randleman
Blake Houston Allen .... Matthews
Herbert Lee Cameron .... Vass
Thomas Elijah Cartner .... Mocksville
*Walter McDonough Croom .... Delco
James Erastus Davis .... Waynesville
Malcolm Weathersby Edge .... Fayetteville
William Lee Edgerton, Jr. .... Union Mills
Howard Holdford Harper .... Raleigh
Thomas Claxton Henderson .... Lake Toxaway
Ezra Lewis Howell .... Cana
*Gerald Blaine James .... Oakboro
Dan Watson Jones .... Boiling Springs
Selby Dock Kornegay .... Mt. Olive
Kenneth Alexander McKethan .... Raleigh
Freeman Jefferson Marshburn .... Wallace
David Marion Nobles .... Stokes
Glenn Andrew Patton .... Franklin
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David Gaston Starling .... Autryville
John Douglas Tripp .... Blounts Creek
Kenneth Wyatt Underwood .... Salemburg
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IN INDUSTRIAL ARTS EDUCATION

Danford Edmondson Cutchin .... Whitakers
Cecil Wilmont Fry .... Raleigh
William Jardine Gibson .... Gastonia
George Woodrow Jones .... Roxboro

* With Honors.
** With High Honors.

IN OCCUPATIONAL INFORMATION AND GUIDANCE

Matthew Joseph Hannon .... Manchester, Mass.
Leonardo Hernan Valderrama Castagnino .... Lima, Peru

SCHOOL OF TEXTILES

BACHELOR OF SCIENCE IN KNITTING

Raymond Osborne Miller .... Concord
**Donald Bain Stilwell, Jr. .... Charlotte

IN TEXTILE CHEMISTRY AND DYEING

*Richard Norwood Edkins .... Chapel Hill
*Charles Russell Kuhn .... Raleigh
Joseph Glenn Melton .... Avondale
John Melvin Pharr .... Concord
Arthur Woodburn Powell .... Miami, Fla.
Patricio Reyes Spindola Lebrija .... Mexico City, Mex.

IN TEXTILE MANAGEMENT

Wayne Dewey Alexander .... Concord
Charles Robert Bollin .... Mayodan
Jennings Mackeral Bryan, Jr. .... Burlington
George Dewey Clayton .... Cary
Ralph Degen .... New York, N. Y.
**Oliver Max Gardner, Jr. .... Shelby
Marvin Lewis Hagan .... New York, N. Y.
John Wade Hendricks, Jr. .... Shelby
Edmund William Koury .... Burlington
James MacDonald, Jr. .... Charlotte
*Cyma May Saltzman .... Brooklyn, N. Y.
Stanley Charles Schwartz .... Baltimore, Md.
John Anthony Straus .... New York, N. Y.

IN TEXTILE MANUFACTURING

Charles Wallace Armstrong, Jr. .... Salisbury
Dan Isaac Bartlett .... Old Town, Va.
Alejandro Bautista O'Farrill .... Puebla, Mexico
Irwin Berkelheimer .... New York, N. Y.
*Edwin Neil Brower, Jr. .... Hope Mills
Thomas Jackson Clark .... Charlotte
Mario Cohen .... Miami Beach, Fla.
William Herbert Crowder, Jr. .... Salisbury
Joseph Leroy Finley .... Wellford, S. C.
Harvey Oscar Forrest .... Mt. Airy
James Daniel Gaskins .... New Bern
Mehmet Hizir Geylan .... Istanbul, Turkey

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* With Honors.
** With High Honors.

Charles Lamb Gilliam .... Franklinton
Robert Lawrence Gorman .... Troy, N. Y.
*John Ross Harris .... Cambridge, Md.
*Homer Eugene LeGrand .... Shelby
George Ferdinand Lundberg, Jr. .... Chicago, Ill.
Hubert Franklin McLendon .... Burlington
Pearse LeBaron Mathewson .... Bristol, R. I.
*Daniel Martin Matusow .... Bronx, N. Y.
Milton Collins May .... New Bern
*William Andrews Newell .... Jewett City, Conn.
Claude Murray Roberts .... Salisbury
*Harvey Morton Scherr .... Asheville
Hubert Young Simerson .... Spencer
Taylor Bain Sparrow .... Greensboro
Salvador Valencia De Anda .... Mexico City, Mex.
Herbert Stapleton Verrill .... Westbrook, Maine
Marshall Postell Watkins .... Norwood
*John Howard Williams .... Gastonia
*Woo Ji Tsun .... Shanghai, China
*Philip Yagolnitzer .... Bronx, N. Y.

IN WEAVING AND DESIGNING

Hugh McMahan Clement .... Goldsboro
Kathleen Phillips .... Lumberton
Winfred Parker Taylor .... Woodland
Sidney Anne Tooly .... Belhaven

ADVANCED DEGREES

MASTER OF SCIENCE

IN AGRICULTURAL CHEMISTRY

Norma Burgess Carroll .... Raleigh
Martin Abraham Hoffman .... Baltimore, Md.
Harriet Byrne Pressly .... Raleigh

IN AGRICULTURAL ECONOMICS

Richard Comings Larkin .... Atlanta, Ga.
Charles Brice Ratchford .... Gastonia

IN AGRONOMY (FIELD CROPS)

Douglas Scales Chamblee .... Zebulon
Samuel Hill Dobson .... Statesville
Chi Seng Hsiong .... Nanchang, Kiangsi, China
Thurston Jefferson Mann .... Lake Landing
Warren Cleaton Shaw .... Roanoke Rapids

IN EXPERIMENTAL STATISTICS

Joseph Marion Cameron .... Akron, Ohio

* With Honors.

IN FORESTRY

Julian George Hofmann . . . . Raleigh
Austin Agnew Pruitt . . . . Carteret, N. J.

IN PLANT PATHOLOGY

Haruo Murakishi . . . . Concord, Cal.

IN CERAMIC ENGINEERING

Percy Pickett Turner, Jr. . . . . Greensboro

IN CHEMICAL ENGINEERING

David Samuel Weaver . . . . Raleigh

IN DIESEL ENGINEERING

Walter Lowen . . . . Schenectady, N. Y.

MASTER OF DAIRY MANUFACTURING

Kenneth Lee Phillips . . . . Raleigh

MASTER OF CIVIL ENGINEERING

Marl Ellis Ray . . . . Raleigh

MASTER OF AGRICULTURAL EDUCATION

Joseph Graham Pollock . . . . Gatesville

MASTER OF OCCUPATIONAL INFORMATION AND GUIDANCE

William Elton Adams . . . . Raleigh
Dorothea McDowell . . . . Wilmington

PROFESSIONAL DEGREE

CERAMIC ENGINEER

Joseph Carol Richmond . . . . Washington, D. C.

HONORARY DEGREES

DOCTOR OF AGRICULTURE

John Redd Hutcheson . . . . Blacksburg, Va.

DOCTOR OF ENGINEERING

Charles Burt Stainback . . . . Pittsburgh, Pa.
Harry H. Straus . . . . Brevard

DOCTOR OF TEXTILE SCIENCE

John Washington Clark . . . . Greensboro

MEDALS AND PRIZES

SCHOLARSHIP DAY AND COMMENCEMENT, 1947

Alpha Zeta Scholarship Cup
Charles Wilson Suggs, Sophomore, Agricultural Engineering
Whiteville, N. C.

Alumni Athletic Trophy
Curtis Lee Ramsey, Sophomore, Textiles
Crumpler, W. Va.

American Institute of Chemical Engineers' Award
Marshall Edward Propst, Jr., Junior, Chemical Engineering
Charlotte, N. C.

Ceramic Awards
(A) J. C. Steele Scholarship Cup (Upperclassman)
Robert Eure Brickhouse, Jr., Senior, Ceramic Engineering
Warrenton, N. C.

(B) Moland Drysdale Scholarship Cup (Freshman)
Richard David Dillender, Jr., Freshman
Darlington, S. C.

Eta Kappa Nu Award (Electrical Engineering)
Henry Archibald Corriher, Jr., Sophomore, Electrical Engineering
Hendersonville, N. C.

Gamma Sigma Epsilon (Chemistry)
Eustace Robinson Conway, III, Senior, Chemical Engineering
Greenville, N. C.

Phi Kappa Phi Medals
(A) Senior—Eustace Robinson Conway, III, Senior, Chemical Engineering
Greenville, N. C.

(B) Junior—William Colonel Roe, Junior, Industrial Engineering
Asheville, N. C.

(C) Sophomore—Melvin Edwards Griffing, Junior, Mechanical Engineering
Bridge Hampton, N. Y.

Sigma Pi Alpha Award (Language)
Emilio Yachan, Senior, Textile Manufacturing
Santiago, Chile

Textile Awards
(A) National Association of Cotton Manufacturers' Medal
Oliver Max Gardner, Jr., Senior, Textile Manufacturing
Shelby, N. C.

(B) Sigma Tau Sigma Award
Oliver Max Gardner, Jr., Senior, Textile Manufacturing
Shelby, N. C.
(C) Phi Psi Key
Donald Bain Stilwell, Jr., Senior, Knitting
Charlotte, N. C.

Xi Sigma Pi Award (Forestry)

(A) Henry Clinton Dellinger, Freshman, Forestry
Connelly Springs, N. C.
(B) Norman Hodul, Senior, Forestry
New York, N. Y.

Kappa Phi Kappa Award (Education)

Gerald Blaine James, Senior, Agricultural Education
Oakboro, N. C.

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