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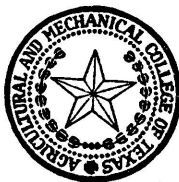
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THE GRADUATE SCHOOL  

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RECORD OF THE SESSION 1934-35

ANNOUNCEMENTS FOR THE SESSION 1935-1936



COLLEGE STATION, TEXAS

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# GRADUATE SCHOOL CALENDAR

## Summer Session 1935

JUNE 4, Registration for first term.

JULY 13, First term ends.

JULY 15, Registration for second term.

AUGUST 7, Candidates for degrees in August submit completed theses.

AUGUST 24, Second term ends.

## Regular Session 1934-1934

1935

SEPTEMBER 16, Opening of the first semester.

SEPTEMBER 18, Registration of graduate students.

NOVEMBER 11, Observance of Armistice Day.

DECEMBER 20, Christmas recess begins at noon.

1936

JANUARY 2, Classes resumed at 8 a. m.

FEBRUARY 1, Close of first semester.

FEBRUARY 3, Registration for second semester.

FEBRUARY 4, Opening of second semester.

APRIL 16-18, Spring recess.

MAY 9, Candidates for degrees in June submit completed theses.

MAY 24, Commencement Sunday.

MAY 29-30, Commencement.

## OFFICERS OF ADMINISTRATION

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## THE GRADUATE SCHOOL

*General Statement.*—The graduate School of the Agricultural and Mechanical College of Texas was established in 1924. Prior to that time graduate work was administered by the general faculty, acting through a committee on graduate studies. The faculty of the Graduate School consists of such members of the teaching staff and the staff of the Agricultural Experiment Station as the general faculty may determine, and has general jurisdiction over all matters relating to graduate work.

*Administration.*—Matters of general policy are considered by the graduate council, which reports its recommendations to the faculty of the school concerned. In cases in which prompt action is desirable the council is authorized to act, reporting its action to the faculty for ratification.

The executive committee, consisting of nine members of the council, is authorized in routine matters to take action in accordance with the general policies.

The Dean of the Graduate School is the representative of the faculty in dealing with individuals, and is charged with the execution of its regulations. Petitions are acted upon by the Dean or by the executive committee as the case may require.

All communications relating to graduate work should be addressed to the Dean of the Graduate School.

*Character of Graduate Work.*—The principal aim of graduate study is the development of the power of independent work and the promotion of the spirit of research. Each candidate for a degree is expected to have a wide knowledge of his subject and of related fields of work; the graduate student is not expected to get from lecture and laboratory courses all of the knowledge and training necessary to meet the requirements for his degree.

Graduate study presupposes a higher standard of excellence than undergraduate study. No graduate credit is granted for work of lower grade than "C", and to receive the M.S. degree, the candidate must have earned a total of 48 grade points on not to exceed 32 credit hours of graduate work.

*Degrees.*—The completion of an approved course of study in the Graduate School leads to the degree of Master of Science. Professional degrees in Engineering—Agricultural Engineer, Architectural Engineer, Chemical Engineer, Civil Engineer, Electrical Engineer, Mechanical Engineer—are offered on the basis of acceptable professional experience, a thesis, and an examination.

The Master of Science degree with "Municipal Administration" designated as the major field is awarded to eligible students on the completion of

programs of courses which in the judgment of the Graduate Committee are appropriate thereto. These programs will be built around courses in Municipal & Sanitary Engineering and will be differentiated for students who have done undergraduate work in engineering and for others.

#### REQUIREMENTS FOR THE MASTER'S DEGREE

*General.*—The Master's degree denotes that attainment which a student of good native ability, who has received an appropriate bachelor's degree, may reasonably expect to achieve in one year of entire and successful devotion to advanced studies, with adequate facilities and under competent direction. The courses of study leading to this degree do not make research the chief consideration, but are intended to serve as an introduction to the methods and discipline of research.

*Specification as to Course.*—The course of study pursued is specified in the diploma. In his application for admission the student must designate his major courses of study.

*Admission.*—In order to be admitted to a course of study leading to the master's degree, the candidate must satisfy the following requirements:

1. He must be a graduate of this College or of some other approved institution whose requirements for graduation are substantially equivalent to those of this College.

2. To major in any department, a candidate for the master's degree must meet the requirements of that department for the bachelor's degree at this College. This is especially important as regards basic sciences and fundamental technical subjects.

To minor in any department, the candidate must meet such undergraduate requirements as, in the opinion of the head of the department concerned, are prerequisite to the graduate courses.

3. His undergraduate record must be of such high order as to satisfy the committee that he is qualified by native ability and by training to pursue graduate studies with profit and with credit. In case it does not fully meet this requirement, the committee may require the completion of additional undergraduate work with a grade of at least "B":

*Application.*—Application for admission should be made at least one month in advance, and in case the candidate comes from another institution, his application must be accompanied by a complete transcript of his undergraduate record, properly certified.

*Admission to Candidacy.*—Admission as a graduate student does not imply admission as a candidate for a degree. In order to become a candidate for an advanced degree, the student must make formal application—in the regular session before December 15 and in the summer session one week before the close of the first term. The application will be approved only in case

the student has demonstrated his ability to do graduate work in a creditable manner.

*Registration.*—Graduate students must register at the beginning of each semester at the office of the Registrar and of the Dean.

*Amount of Work.*—The candidate for the degree of Master of Science must do at least one full year's work. By this is meant that he must register for, attend and complete at least eight courses of four credit hours each or the equivalent and, in addition, must submit a satisfactory thesis. Full time members of the College staff are not permitted to register in any one semester for more than one fourth of a full semester's work.

*Course of Study.*—The subjects constituting the student's complete course of study are to be chosen subject to the approval of the executive committee. Of the eight full-semester courses required, at least seven must be done in this College.

In general, the work must be made up of graduate courses. In cases in which it may be deemed advisable, as much as twelve credit hours may consist of courses listed herein "For graduates and advanced undergraduates." Each hour of theory involves two hours of preparation.

*Major and Minor Subjects.*—For the degree of Master of Science the candidate must choose a major subject and one or two minor subjects. A major or a minor denotes the field of knowledge of a department. With the approval of the executive committee, the major may be taken in two closely-allied departments. In his major subject the student must take at least two full-semester courses each semester, in addition to his thesis. Courses in minor subjects must be chosen by the student after consultation with the head of his major department.

*Residence.*—The master's degree will not be conferred except after a residence of at least one year at the College. For candidates engaged in teaching or other regular employment, the period of residence will be increased to such extent as the committee may determine.

*Work in Summer Session.*—The residence requirement may be satisfied by residence during four summer terms of six weeks each. Courses offered in the summer session cover essentially the same ground as that covered by the corresponding courses of the regular session. The maximum amount of work for which a student may register in a summer term is two full-semester courses. In the summer session, each hour of theory involves three hours of preparation.

The candidate who spends only four summer terms in residence may fulfill the requirements for the master's degree, provided that, in the *ad interim* period between summer sessions, he does the greater part of the work on his thesis. Authority to do thesis work in this way must be obtained through the Dean, and the student must make such reports of progress as the head of his major department may require.

*Extension Class Work.*—Work done in extension classes may be allowed graduate credit to the extent of not more than six credit hours, provided:

1. That in each case both the courses and the instructor be approved by the Committee on Graduate Studies and by the Faculty of the Agricultural and Mechanical College of Texas.

2. That before taking such a course the applicant be accepted for admission to the Graduate School and admitted to the course by the Committee on Graduate Studies.

3. That no such credit be finally allowed as part of the requirements for a degree in this institution until the student has demonstrated, by work done in residence at the Agricultural and Mechanical College of Texas, that he can pursue graduate study with profit.

Students who are in residence during summer sessions only must do the greater part of their thesis work between summer sessions, as stated above.

*Short Unit Courses.*—For the benefit of teachers of vocational agriculture whose summer vacation is limited to three weeks, provision is made by which they may take the first half of a course one summer and the second half another summer. The letter "M" and "N" written after a course refer, respectively, to the first and second half of the course. Credit is not given until both halves have been completed.

*Courses Offered by Experiment Station Staff.*—In addition to the courses offered by the several departments of instruction, there are graduate courses offered by members of the Agricultural Experiment Station staff and described under the respective departments of instruction.

*Special Opportunity for the Study of Cotton.*—The College offers unusual opportunity for the thorough study of cotton in all its phases. The following graduate courses in that field are described under the respective departments: Advanced Cotton Production, Genetic Studies in Cotton, Research in Cotton Breeding, Cotton Insects, Cotton Seed Oil, Cotton Machinery, Cotton Marketing Problems. Undergraduate courses in this field include: The Cotton Plant, Fiber Crops, Cotton Insects, Cotton Research Problems, Cotton Machinery, Cotton Marketing. The manufacture of cotton is covered in the courses offered by the Department of Textile Engineering.

*Quality of Work.*—In order to be allowed to go on with his course, a graduate student must give continued satisfaction in his work.

*Initiative.*—In carrying on his work in the Graduate School, the student is expected to keep himself informed as to the regulations and to assume the initiative in complying with them.

*Thesis.*—The candidate must submit a thesis, which shall be based upon his work in the department in which he takes his major subject. The thesis project must be submitted to the committee for approval, through the head

of the department in which it is to be written, by December 15. In matter and style, the thesis must be acceptable to the head of the department in which it is written and to the committee. It must show that the candidate has the ability to do independent work; and, by correct citation of authorities, must show that he has satisfactory acquaintance with the literature of his field.

The thesis must be typewritten on paper 8½ inches by 11 inches; four weeks before commencement it must be presented to the Dean through the head of the department in completed form, ready for binding. Before the degree is conferred, a bound copy for the College library must be deposited with the Dean.

*Examinations.*—At the close of the semester, written examinations are held in each graduate course, and it is the duty of the head of the department concerned to file with the Dean a copy of the questions. In addition to the semester examinations, a student must pass a final examination covering his entire course of study and his thesis. The final examination may be oral or written, or both, and is open to the committee and to members of the Faculty.

*Reports.*—Heads of departments will make reports to the Registrar at the end of each semester on all graduate work done in their respective departments, and such other reports on the progress of their graduate students as the Dean may request.

*Special Committee.*—The instructors under whom a graduate student takes work constitute a special committee to direct and advise him concerning his work and to represent him before the executive committee. The instructor in charge of the major subject shall be chairman of the special committee in each case.

### EXPENSES

The necessary expenditures of the graduate student for the regular session of nine months are as follows:

	First Semester	Second Semester
Matriculation Fee.....	\$ 25.00	\$25.00
Medical Service Fee.....	5.00	5.00

*Notes* 1. While residence in the college dormitories is not required of graduate students, a great majority of the unmarried men prefer to room in Graduate Hall, a dormitory set apart exclusively for their use. Room rent is \$15 per semester.

2. Graduate students who elect to take their meals at the College Mess Hall pay a Maintenance Fee, covering board and laundry, of \$212 for the academic year, payable as follows: on entrance, \$39; November 1, \$26; December 1, \$17.50; January 2, \$27.50; at opening of second semester, \$23.50; March 1, \$26.50; April 1, \$26; May 1, \$26.

3. Refund of maintenance will be made only in case the student is required to withdraw by Faculty action or in the case of sickness disqualifying him for the discharge of his duties for the rest of the term. When such sickness takes place at the College, it must be attested by the College Physician before the student can receive the refund of the unused portion of his maintenance fee.
4. All students registering for 12 or more credit hours are required to pay the \$25.00 matriculation fee. All students registering for less than 12 credit hours will pay a matriculation fee of \$2.00 per credit hour, but the minimum may not be less than \$7.50.
5. All recipients of advanced degrees are required to pay a diploma fee of \$5.00.

For expenses in the Summer Session, reference should be made to the Summer Session number of the College Bulletin.

*Expense of Non-resident Students.*—The matriculation fee for a non-resident student shall be an amount equivalent to that charged students from Texas by a similar school in the State of which the student shall be a resident and shall not be less than the amount charged resident students. A non-resident student is defined to be a student of less than twenty-one years of age, living away from his family and whose family resides in another State, or whose family has resided within this State for a period of time less than twelve months prior to the date of registration, or a student of twenty-one years of age or over who resides out of the State, or who has resided within the State for a period of less than twelve months prior to the date of registration.

*Expense of Day Students.*—Day students pay all specified fees and charges, except maintenance and room rent.

*Leaves of Absence or Withdrawal.*—Requests for authority to be absent from the College or to withdraw permanently must be presented to the Dean through the Commandant.

*Graduation.*—Candidates for advanced degrees who expect to complete their work at the end of a given semester must give written notice to the Dean and to the Registrar to that effect at least one month in advance. When a candidate has, to the satisfaction of the executive committee, completed the requirements for an advanced degree, he will be recommended to the faculty for his degree.

*Honors.*—The committee which conducts the final (oral) examination of a candidate for the Master of Science degree shall, in the case of a student satisfactorily passing the examination, recommend that he be awarded the degree either without notation indicative of special merit, or "with honor," or "with high honor." In arriving at the honors to be awarded, the committee shall give consideration to the grades made in the candidates' several courses but more especially to the merit of the candidate's thesis and his mastery of his field of study as evidenced by the final examination.



## PROFESSIONAL DEGREES IN ENGINEERING

The professional degrees in engineering, Agricultural Engineer, Architectural Engineer, Chemical Engineer, Civil Engineer, Electrical Engineer, Mechanical Engineer, are open only to men who have received from this College the degree of Bachelor of Science or Master of Science in an engineering course.

The requirements for any one of these degrees include acceptable professional experience, a thesis and an examination. In detail the requirements are as follows:

The candidate must have been engaged in acceptable professional work for a period of not less than four years after graduation, and must have been in responsible charge of such work for at least one year. The applicant who holds the degree of Master of Science in an engineering course is regarded as having met the time requirement if he has devoted three years to professional practice or to teaching engineering subjects.

In connection with his application for authority to register, the candidate must submit an orderly and detailed statement of his professional experience for the consideration of the executive committee. He must also submit the title and a general outline of the thesis.

At a time to be designated by the Dean he must report at the College for an examination covering his professional experience, his thesis and the research or study which forms its basis.

The thesis must correspond in form to the master's thesis described above. It must not be simply a descriptive discussion of some ordinary engineering project, nor a digest of engineering literature, but must be of an analytical character, and must constitute a distinct contribution to engineering science. The thesis in final form must be in the hands of the Dean four weeks before commencement.

The degree is conferred only at commencement, and application for registration must be made not later than November 1, preceding. In case a student does not complete the work for his degree within two years after registration, his registration will be cancelled.

The matriculation fee of \$5.00 is to be paid upon registration.

## SCHOLARSHIPS AND FELLOWSHIPS OFFERED BY THE COLLEGE

The College offers annually a limited number of graduate assistantships and fellowships, each carrying a stipend of \$405.00 in the first year of service or \$450 in the second. In either case, payments are made in nine equal installments.

An applicant for an assistantship or a fellowship must meet the requirements for admission to the Graduate School and must express his intention of completing in this College the requirements for the master's degree. He must also agree, in consideration of the award, to render approximately half time service, to be assigned by the Dean of the Graduate School and the head of the department in which he takes his major work.

Application must be made on forms to be obtained from the Dean of

the Graduate School and must be accompanied by a letter of recommendation from the President or other officer of the institution from which the applicant comes.

Nominations to assistantships or fellowships are made on the basis of worthiness of character, scholastic attainments, and promise of success in the principal field of study to which the applicant proposes to devote himself. They are made by the Dean of the Graduate School, subject to the approval of the President.

#### ADDITIONAL FELLOWSHIPS

For a number of years graduate fellowships for research in industrial problems have been made available to students of the A. & M. College by the Texas Power and Light Company, The Texas Cottonseed Crushers' Association, Anderson Clayton & Co., The National Cottonseed Products Association and The American Soya Products Corporation. Information concerning these will be supplied on request.

## COURSES OF INSTRUCTION BY DEPARTMENTS

The courses of instruction are described on the following pages under the departments in which they are given. Courses numbered 301 to 499 are advanced courses accepted for undergraduate credit and for graduate credit under the restriction that not more than twelve credits in these courses may be offered in fulfillment of the requirements for the master's degree. Courses numbered 501 to 599 are for graduate students only. First-semester courses are, as a rule, given odd numbers, second-semester courses even numbers.

The figures in parentheses, following the name of a course, indicate the number of hours per week, theory and practice, respectively, devoted to the course. The credit value of the course is also indicated. The letter "S" indicates that the course is offered in the summer session only.

### ACCOUNTING AND STATISTICS

T. W. Leland, M.A., C.P.A., *Professor and Head of the Department.*

O. A. Weinke, M. S., *Associate Professor.*

T. R. Hamilton, M.S., *Associate Professor.*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

301. *Theory and Practice of Accounting.* (3-3) *Credit 4.*

Fundamental process of accounting, special phases of corporation accounting, introduction to actuarial accounting, specific asset and liability accounts, consignments, installment sales, depreciation, analysis of financial condition and results of operation.

302. *Theory and Practice of Accounting.* (3-3). *Credit 4.*

A continuation of course 301. Statement of application of funds, partnership accounting, insurance, accounting for insolvent concerns, branch accounting, parent company and subsidiary accounting, consolidations, foreign exchange, estates and trusts, introduction to budgeting.

303. *Statistical Method.* (3-3) *Credit 4.*

Collection, tabulation, presentation, and analysis of data. A study of sampling, graphics, averages, ratios and coefficients, dispersion, skewness, probability and error, index numbers, seasonal and long-time trend, barometers and linear correlation.

401. *Cost Accounting.* (2-3). *Credit 3.*

Development of cost accounting principles, cost elements, methods of control, order and process systems, estimated and standard costs, debatable points of theory, uniform methods. Prerequisite: Accounting and Statistics 301.

402. *Accounting Systems.* (2-2). *Credit 3.*

A study of special features of accounting for various types of enterprises, an analysis of the accounting systems devised and recommended by government agencies and trade associations. Each student is expected to devise a

system for some business organization. Prerequisite: Accounting and Statistics 301.

403. *Income Tax.* (3-0). *Credit 3.*

Income tax legislation; the present income tax law, regulations, treasury decisions, court decisions and departmental rulings, income tax problems and returns. Prerequisite: Accounting and Statistics 202.

406. *Agricultural and Business Cycles.* (3-0). *Credit 3.*

An empirical and statistical study of agricultural data, production, consumption and price indexes; analysis of seasonal and long-time trends, and factors constituting cyclical fluctuation; theory, causes, effects and control of cycles. Prerequisite: Accounting and Statistics 303.

407. *Auditing.* (3-3). *Credit 4.*

Theory and practice of auditing; types of audits; audit procedure for individual assets, liabilities, and nominal accounts; working papers and reports; case studies. Prerequisite: Accounting and Statistics 301. (Formerly numbered 304).

408. *Advanced Auditing.* (3-0). *Credit 3.*

Case studies in auditing, financial investigations, auditing reports, certificates, statements giving effect to financing. Prerequisite: Accounting and Statistics 407.

409. *Accounting for Engineers.* (3-0). *Credit 3.*

Study of the principles of accounting directly related to the problems of the engineer, contractor, and architect; survey of the general accounting system as the source of cost data; development of the fundamental principles of valuation; introduction to cost accounting.

410. *Accounting Seminar.* (3-0). *Credit 3.*

Cost accounting literature, research on valuation, income, budgeting, or other accounting problems. Prerequisite: Accounting and Statistics 401, 407.

FOR GRADUATES

501. *Statement Analysis.* (3-3). *Credit 4.*

An analytical study of the different kinds of statements for the guidance of executives, investors and creditors; balance sheet and profit and loss ratios. Prerequisite: Accounting and Statistics 304, 401.

502. *Specialized Accounting.* (3-2). *Credit 4.*

Consideration of the accounting problems and the practices peculiar to specific industries. Class work on municipal, bank, insurance, and public utility accounting. Individual reports on problems in the above fields or in specific lines of manufacturing, wholesaling or retailing. Prerequisite: Accounting and Statistics 201, 202.

503. *Price Analysis.* (2-3). *Credit 3.*

Economic concepts relating to prices, statistical methods of analyzing

prices, supply and demand curves, elasticity of demand, price forecasting, study and criticism of works on price analysis. Term paper required on factors affecting the price of an agricultural commodity. Prerequisite: Accounting and Statistics 303, Economics 203, 204.

504. *Advanced Statistics.* (2-3). *Credit 3.*

II

Curve fitting and empirical formulas. The study of measurements of relationship. Multiple correlation, linear and non-linear; part and partial correlation; research studies involving the application of multiple correlation. Sampling and measures of unreliability. Mathematical fitting of normal curves. Prerequisite; Accounting and Statistics 303, Mathematics 101 or 111.

### AGRICULTURAL ECONOMICS

J. W. Barger, M.A., C.L.U., *Professor and Head of the Department.*

\*S. A. McMillan, M.S.A., *Professor.*

L. S. Paine, M.A., *Associate Professor.*

R. L. Hunt, Ph.D., *Assistant Professor.*

L. P. Gabbard, M.S., *Chief, Farm and Ranch Economics, Agricultural Experiment Station.*

W. E. Paulson, Ph.D., *Marketing Research Specialist, Agricultural Experiment Station.*

C. A. Bonnen, M. S., *Farm Management Research Specialist, Agricultural Experiment Station.*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

413. *Cooperative Marketing of Farm Products.* (3-0). *Credit 3.*

A study of farmers' cooperative marketing and purchasing organizations in the United States and foreign countries from the standpoints of their history, economic philosophy, factors of success and failure, types of organization, business methods, legal aspects, governmental relationships, and potential development. Prerequisite: Agricultural Economics 314.

420. *Market Analysis.* (3-0). *Credit 3.*

Methods used by business concerns in the analysis of selling, advertising, and merchandising problems; market surveys, with emphasis upon the necessity of thorough fact finding as a basis for sales budget plans; measurement of the profitableness of different types and sizes of operating units; determination of effectiveness of advertising and selling effort; problems, and methods of demand creation; choosing channels of distribution; importance of market measurement in the determination of company policies. Prerequisite: Agricultural Economics 425.

425. *Wholesale and Retail Merchandising.* (3-0). *Credit 3.*

A systematic description and a critical analysis of the fundamental operations of wholesale and retail concerns, particularly those serving agricultural communities. Prerequisite: Economics 203 and 204, or 403.

\* On leave, 1934-1935.

426. *Sales Organization.* (3-0). *Credit 3.*

A consideration of the general principles of successful personal selling, sales organization and sales management; analysis of some carefully selected sales problems of concerns handling industrial and agricultural products. Prerequisite: Economics 203 and 204, or 403.

429. *Economic Policy for Agriculture.* (2-0). *Credit 2.*

The economic position of agriculture, particularly since the World War; the factors contributing to maladjustment in agriculture; collective efforts and governmental action in farm relief, with special emphasis on the organization, operations, and objectives—both immediate and long-term—of the Agricultural Adjustment Administration. Prerequisite: Economics 203 and 204, or 403; or Agricultural Economics 312.

FOR GRADUATES

501, 502. *Advanced Marketing Problems.* (4-0). *Credit 4 each semester.*

A thorough study of the problems involved in marketing farm products such as price determining factors; costs affecting distribution; operation of produce exchanges and future markets; governmental regulation of middlemen and marketing services; and adjustment of supply to demand individually, cooperatively, and by governmental aid. Prerequisite: Agricultural Economics 314.

503. *Land Problems.* (4-0). *Credit 4.*

An extensive study of problems involved in developing state and national policies for the proper utilization of our land resources. Prerequisite: Agricultural Economics 423.

511. *Farm Management Surveys.* (2-4). *Credit 3.*

Methods of making surveys of regional systems of farming; analysis of survey data; use of findings in formulating farm organization and management programs. Practice work consists of surveying actual farms and ranches. Prerequisite: Agricultural Economics 421.

512. *Cotton Marketing Problems.* (4-0). *Credit 4.*

Extensive study of potential cotton areas of the world, trends in production; trends of consumption of cotton and substitutes for cotton in the various consuming areas; national and international policies that affect the cotton farmers; price determining factors in the various markets; governmental aid in estimating supply, and demand, regulations of standards, and control of futures markets; cooperative versus individual sale of cotton. Prerequisite: Agricultural Economics 427.

514. *Contemporary Problems in Agricultural Economics.* (4-0). *Credit 4.*

A critical consideration of some of the most important contemporary problems in agricultural economics. Prerequisite: Agricultural Economics 312 or 429; and 430.

571, 572. *Research Methods*. (2-6). *Credit 4 each semester*.

Principles of research as applied to the field of agricultural economics. Practice work consists of an analysis of the research projects in agricultural economics conducted by federal agencies, state Agricultural Experiment Stations, and by private research institutions. Special attention to the methods and programs of the Division of Farm and Ranch Economics of the Texas Agricultural Experiment Station. Prerequisites: Agricultural Economics 312 or 429; 314 and 430.

## AGRICULTURAL EDUCATION

C. H. Winkler, Ph.D., *Professor and Head of the Department*.

E. R. Alexander, M.S., *Professor*.

\*J. C. Dykes, B.S., *Professor*.

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

401, 402. *Teaching Vocational Agriculture*. (2-6). *Credit 4 each semester*.

Analysis of the agricultural teacher's job; courses of study; annual plan; lesson plans; project outlines and supervision; equipment; reports; observation and directed teaching.

### FOR GRADUATES

(Agricultural Education 401, 402 are prerequisites to the following courses.)

501, 502. *Advanced Methods in Agricultural Education*. (4-0). *Credit 4 each semester*.

An advanced course in methods of teaching vocational agriculture.

505. *Supervised Practice*. (4-0). *Credit 4*.

An advanced study of supervised practice in vocational agriculture.

507. *Future Farmer Activities*. (2-0). *Credit 2*.

Methods of conducting future farmer activities of statewide importance.

508. *Promotional Activities in Vocational Agriculture*. (2-0). *Credit 2*.

Principles of news writing, plans for collective exhibits, instructional booths, fairs and contests. Open only to teachers of Vocational Agriculture.

509. *Part Time Classes*. (2-0). *Credit 2*.

Methods of organizing and conducting part-time classes in vocational agriculture.

510. *Evening Schools*. (2-0). *Credit 2*.

Methods of organizing and conducting evening schools in vocational agriculture on a participation basis.

511. *Evening School Problems*. (2-0). *Credit 2*.

Supervision of practice work, determining course content, follow-up work,

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\*Resigned.

setting up publicity programs, and evaluating improved practices resulting from evening school instruction.

512. *Agricultural Outlook Material.* (2-0). *Credit 2.*

Methods of using agricultural outlook material. Open to teachers of agriculture and county agents who have had a course in cooperative marketing.

513. *Administration and Supervision of Agricultural Education.* (2-0). *Credit 2.*

Problems of organization, administration, and supervision of vocational agriculture, experiment station and extension work.

514. *Research and Thesis Problems.* (2-0). *Credit 2.*

### AGRICULTURAL ENGINEERING

D. Scoates, A.E., *Professor and Head of the Department.*

F. R. Jones, M.S., *Associate Professor.*

M. F. Thurmond, M.S., *Associate Professor*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

425. 426. *Seminar.* (1-0). *Credit 1 each semester.*

A review and presentation of the results of specially selected lines of research dealing with Agricultural Engineering.

#### FOR GRADUATES

501, 502. *Advanced Drainage and Irrigation.* (3-3). *Credit 4 each semester.*

Advanced study of farm drainage and irrigation with special emphasis on recent developments. Prerequisite: Agricultural Engineering 305.

503, 504. *Advanced Farm Machinery.* (3-3). *Credit 4 each semester.*

Advanced study of farm machinery with special emphasis on recent development. Prerequisite: Agricultural Engineering 201.

505, 506. *Advanced Farm Buildings.* (2-6). *Credit 4 each semester.*

Advanced study of farm buildings and farm home utilities. Prerequisite: Agricultural Engineering 418.

507. *Cotton Machinery.* (1-3). *Credit 2.*

An advanced course in cotton machinery used for preparation of seed bed, seeding, cultivating, harvesting and ginning, with special emphasis on recent developments.

509, 510. *Advanced Farm Power.* (2-6). *Credit 4 each semester.*

Advanced study of farm power with special emphasis on recent developments. Prerequisites: Agricultural Engineering 203 and 216.

511. *Advanced Farm Shop.* (3-3). *Credit 4.*

Advanced study of farm shop with special emphasis on problems relative



to teaching the course; i. e., equipment, methods, supplies and projects. Prerequisite: Agricultural Engineering 321, 322.

513, 514. *Advanced Soil Erosion Engineering.* (3-3). *Credit 4 each semester.*

The advanced study of design, construction, and layout of terraces and other obstructions used for the control of soil erosion, as well as the outlet structures for same, with special emphasis on late developments.

515, 516. *Technical Research.* *Credit 2 to 6 each semester.*

Projects subject to the approval of the head of the department.

## AGRONOMY AND GENETICS

E. P. Humbert, Ph.D., *Professor and Head of the Department.*

L. G. Jones, Ph.D., *Professor.*

W. R. Horlacher, Ph.D., *Professor.*

J. S. Mogford, M.S., *Associate Professor.*

R. T. Stewart, Ph.D., *Associate Professor.*

C. B. Godbey, M.S., *Associate Professor.*

D. T. Killough, M.S., *Agronomist; Cotton Breeding, Agricultural Experiment Station.*

### Agronomy

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

413. *Soil and Crop Problems.* (3-0). *Credit 3.*

Special problems dealing with the management and utilization of distinctive types of soils and soil conditions and a detailed consideration of crop management problems under varying soil and climatic conditions. Prerequisite: Agronomy 301.

#### FOR GRADUATES

501, 502. *Advanced Farm Crops.* (3-4). *Credit 4 each semester.*

An advanced study of field crop production and breeding, including a review of the more recent and noteworthy investigations in this field.

505, 506. *Advanced Soils.* (3-4). *Credit 4 each semester.*

A review of our present knowledge of the soil as a medium for plant growth; study of the more recent and noteworthy investigations pertaining to soils and fertility.

507, 508. *Advanced Cotton Production.* (3-4). *Credit 4 each semester.*

An advanced study of cotton from the standpoint of species, varieties, breeding, fertilization, tillage practices, and harvesting. In the course extended use is made of recent cotton literature in scientific journals, experiment station bulletins, and such reference books on cotton as are available.

509, 510. *Research Problems.* *Credit 1 to 4 each semester.*

Technical research problems subject to approval of head of department.

## Genetics

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

301. *Genetics*. (3-2). *Credit 4*.

Fundamental principles of genetics; heredity; variation; Mendelism; the expression and interaction of genes; the physical basis of inheritance; the chromosome theory of inheritance; linkage; sex and its inheritance; an introduction to biometrical methods; laboratory work with *Drosophila*. Prerequisite: Biology 101, 102.

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

501, 502. *Advanced Plant Genetics*. (3-4). *Credit 4 each semester*.

Specialized study of plant genetics. Opportunity to specialize in some commercial crop. Standard text books and current scientific literature used.

503, 504. *Advanced Animal Genetics*. (3-4). *Credit 4 each semester*.

Specialized study of animal genetics. Opportunity to specialize on some breed of farm animals, guinea pigs, pigeons or *Drosophila*. Standard text books and current scientific literature used.

505, 506. *Advanced Biometry*. (3-4). *Credit 4 each semester*.

The application of certain biometric principles to the interpretation of genetic data.

507, 508. *Genetic Studies in Cotton*. (3-4). *Credit 4 each semester*.

A detailed study of cotton genetics and breeding for students especially interested in cotton.

509, 510. *Research Problems*. *Credit 1 to 4 each semester*.

Technical research problems subject to approval of head of department.

571, 572. *Research in Cotton Breeding*. *Thesis*.

A thesis course for students who are majoring in genetics or agronomy and who desire to become familiar with the method of commercial cotton breeding. The problem given to the student will cover, in its completion, in relation to cotton breeding, the biometrical methods; progeny analysis; germination, seedling and maturity tests procedure; stapling; ginning. Students electing this course must first be familiar with the fundamentals of genetics and agronomy. Mr. Killough.

### ANIMAL HUSBANDRY

D. W. Williams, M.S., *Professor and Head of the Department*.

D. S. Buchanan, M.S., *Professor*.

A. K. Mackey, M.S., *Professor*.

J. H. Knox, M.S., *Associate Professor*.

J. M. Jones, A.M., *Chief; Sheep and Goat Investigations, Agricultural Experiment Station*.

B. L. Warwick, Ph.D., *Animal Husbandman; Breeding Investigations, Agricultural Experiment Station*.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

303. *Animal Nutrition.* (3-2). *Credit 4.*

Chemical composition of feeding stuffs, composition of farm animals; digestion; metabolism; functions of nutrients; vitamins; coefficients of digestibility, energy in feeds and its uses; feed requirements of animals; maintenance, growth; fattening; milk production; wool production; work; computation of rations; manurial value of feeds; nature and uses of feed stuffs including cereal by-products, legumes and legume seeds, oil bearing seeds and by-products, packing house by-products, hays, fodders, straws, pastures, forage, silage, and miscellaneous feeds. Prerequisite: Chemistry 212; 214.

406. *Beef Cattle Production.* (3-2). *Credit 4.*

The world beef cattle situation; historical development; systems of production and determination of the place of each; distribution and value in comparison with other meat animals; location of beef enterprise; establishment of the herd; improvement methods; mating and reproduction; calving; feed and care of calf; development of stock for the breeding herd; wintering; summer management; cattle feeding; selection of feeds; value of feeds; financial aspect of beef production; equipment; parasites and diseases; fitting and showing; marketing. Prerequisite: Animal Husbandry 303 or 409.

410. *Sheep and Angora Goat Production.* (3-2). *Credit 4.*

Present status; history in United States; methods and types of sheep raising; pure bred business; breeding; management and feeding of the breeding flock; growing young lambs; fattening sheep and lambs; marketing sheep and lambs; fitting and showing; parasites and diseases. Prerequisite: Animal Husbandry 303 or 409.

412. *Swine Production.* (3-2). *Credit 4.*

Historical; feeding and handling the breeding herd during various seasons; culling; records; the sow and the litter; growing and fattening pigs; forage crops; feeding on forage; dry lot feeding; choice and value of feeds; garbage disposal plants; prevention of disease; slaughtering and curing; the pure bred herd; fitting and showing. Prerequisite: Animal Husbandry 303 or 409.

413. *Horse and Mule Production.* (3-2). *Credit 4.*

Review of situation; historical development; mechanical vs. horsepower; anatomy; unsoundness; ailments and diseases; feeding the brood mare; stallions; growing and developing colts; feeding and handling horses at work; stables and equipment; harness; shoeing; fitting and showing; polo and saddle horse breeding and training; horse markets; jacks and jennets; mule production. Prerequisite: Animal Husbandry 303 or 409.

418. *Wool and Mohair.* (2-3). *Credit 3.*

Microscopic structure; chemical composition; production; preparation for market; market reports; marketing; comparison with other textile materials;

measurement; grading; sorting; scouring; pullaries; process of manufacture of fabrics.

421. *Advanced Studies of Breeds of Live Stock.* (2-0). *Credit 2.*

Methods used in the development of outstanding animals; popular lines of breeding; breed improvement; characteristics and breeding of show winners. Students will be given a choice of one breed of each class of livestock for intensive study. Prerequisite: Animal Husbandry 202.

423. *Seminar.* (2-0). *Credit 2.*

Research methods in animal experimentation; sources of error in experiment work; review of research literature with oral and written presentation. Prerequisite: Animal Husbandry 303, Genetics 301.

424. *Range Live Stock Production.* (3-0). *Credit 3.*

Review of historical development; types of ranges; types and breeds of livestock used; range livestock improvement; handling cattle, sheep and goats during various seasons of the years; culling of herds and flocks; range livestock losses including parasites, deficiency, diseases, droughts; stocking of the range under various conditions; carrying capacity determination; over and under grazing; water development; salting; feeding both regular and under emergency conditions; finishing on the range; equipment; labor; cost of production; marketing. Prerequisite: Animal Husbandry 303 or 409.

FOR GRADUATES

501, 502. *Advanced Animal Nutrition.* (3-3). *Credit 4 each semester.*

A continuation of material covered in course 303; review of more recent investigations; methods of investigations; sources of error.

505, 506. *Advanced Live Stock Production.* (3-3). *Credit 4 each semester.*

A continuation of courses 406, 410, 412 and 413. The course is varied according to the class of livestock in which the student is most interested. Managerial problems of production will be considered in detail.

571, 572. *Wool and Mohair Research.* (3-4). *Credit 4 each semester.*

Offered only by individual agreement, to graduate students qualified by previous training to do thesis work on some portion of an organized wool or mohair research project. Studies under way include a determination of the grades and shrinkages of wool and mohair from registered and unregistered flocks. The wool and mohair grading and scouring laboratory is at the disposal of graduate students taking this course.

573, 574. *Research in Animal Breeding.* (3-4). *Credit 4 each semester.*

A thesis course designed to furnish students majoring in genetics, animal husbandry, or dairy husbandry, the opportunity to work out a breeding problem of sufficient practical importance to be organized as a regular research project of the Experiment Station. Portions of projects already organized are available as thesis subjects and include problems of inheritance in beef cattle, dairy cattle, sheep and goats. Most of the problems available involve principles

both of genetics and either animal husbandry or dairy husbandry, and students electing this course must first be familiar with the fundamentals of those fields.

## ARCHITECTURE

Ernest Langford, M.S., *Professor and Head of the Department.*

C. J. Finney, B.S., *Associate Professor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

415, 416. *The Fine Arts.* (2-0). *Credit 2 each semester.*

History of the fine arts in their relationship to architecture; the historic styles of decoration; the development of furniture and furnishings; a study of the history of sculpture and painting. Prerequisite: Senior classification.

417, 418. *Concrete Structures.* (3-0, 2-3). *Credit 3 each semester.*

Theory of reinforced concrete design and its application in the design of slabs, beams, girders, columns, and footings; concrete buildings. Prerequisite: Architecture 313, or Civil Engineering 305.

421, 422. *Structural Design.* (2-6). *Credit 4 each semester.*

Advanced problems in building construction; wooden and steel trusses; plate girders; critical study of steel frame work for high buildings. Prerequisite: Architecture 314, Civil Engineering 305.

### FOR GRADUATES

501, 502. *Architectural Design.* *Credit 2 to 8 each semester.*

Design of buildings and groups of buildings. Practice, criticisms; consultations; research.

503, 504. *Architectural Construction.* (2-8). *Credit 5 each semester.*

Theory and practice in advanced constructive design; foundations; walls; frames.

505, 506. *Architectural Practice.* (1-4). *Credit 2 each semester.*

Contracts, specifications, superintendence; office methods.

507, 508. *Architectural Presentation.* (0-6). *Credit 2 each semester.*

Sketching, rendering, color harmony and effects.

509, 510. *Mechanical Equipment of buildings.* (1-4). *Credit 2 each semester.*

Theory, practice, and research relating to building sanitation.

## BIOLOGY

O. M. Ball, Ph.D., *Professor and Head of the Department.*

R. G. Reeves, Ph.D., *Professor.*

C. C. Doak, Ph.D., *Associate Professor.*

E. H. Gibbons, S.M., *Assistant Professor.*

R. O. Berry, M.S., *Instructor.*

J. J. Taubenhaus, Ph.D., *Chief, Plant Pathology and Physiology, Agricultural Experiment Station.*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

341, 342. *General Physiology*. (3-4). *Credit 4 each semester.*

The structure of the human body; the physiology of the cell; nutrition, chemistry of food, digestion, metabolism; physiology of the muscular, nervous and circulation systems, and of the special senses. Prerequisite: Biology 203, 204 or 211, 212.

#### FOR GRADUATES

501, 502. *Plant Morphology*. (2-6). *Credit 4 each semester.*

Comparative plant morphology with emphasis on seed plants: morphological technique; taxonomic applications.

503, 504. *Advanced Vertebrate Zoology*. (2-6). *Credit 4 each semester.*

Comparative anatomy of vertebrate types. Origin and development of organs and organ systems.

505, 506. *Advanced Bacteriology*. (2-6). *Credit 4 each semester.*

Advanced methods of bacteriological analyses.

509, 510. *Advanced Plant Physiology*. (2-6). *Credit 4 each semester.*

Responses of the plant to various external and internal stimuli; physiology of growth, nutrition and reproduction.

511, 512. *Biochemistry of the Cotton Seed*. (2-6). *Credit 4 each semester.*

Composition of the various organs and tissues of the cotton seed; standard microchemical methods.

513, 514. *Advanced Plant Pathology*. (2-6). *Credit 4 each semester.*

Morphology and physiology of pathogenic fungi.

515, 516. *Cytology*. (2-6). *Credit 4 each semester.*

An intensive study of the organization and activities of the cell; cytological technique. Emphasis is placed upon topics related to heredity.

#### CHEMISTRY AND CHEMICAL ENGINEERING

C. C. Hedges, Ph.D., *Professor and Head of the Department.*

\*M. K. Thornton, Jr., A.M., *Professor.*

C. W. Burchard, M.A., *Professor.*

F. W. Jensen, Ph.D., *Professor.*

G. S. Fraps, Ph.D., *Chief, Division of Chemistry, Agricultural Experiment Station; State Chemist.*

#### Chemistry

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

301, 302. *Organic Chemistry*. (3-4). *Credit 4 each semester.*

An introduction to the chemistry of the compounds of carbon. A study of general principles, and their application to various industrial processes. The laboratory work serves as the basis of the course. The student here

\* Resigned.

familiarizes himself with the reactions, properties and relations of typical organic compounds. Prerequisite: Chemistry 102.

342. *Physical Chemistry*. (3-4). *Credit 4*.

Explanation of basic chemical theories and principles with reference to their relationship to transformations in living matter. Special development is made of such topics as atomic structure, diffusion and osmotic pressure, colloids, chemical equilibrium, catalysis, reaction velocity, hydrogen-ion concentration and its importance in biological processes. Prerequisite: Chemistry 206, 207 or Chemical Engineering 202.

#### FOR GRADUATES

501, 502. *Advanced Agricultural Chemistry*. (2-6). *Credit 4 each semester*.  
Similar to courses 212, 214, with more advanced work.

507, 508. *Advanced Organic Chemistry*. (2-6). *Credit 4 each semester*.

Analysis and preparation of organic compounds. Prerequisite: Chemistry 302.

511, 512. *Advanced Physical Chemistry*. (3-3). *Credit 4 each semester*.

An intensive study of physical and electro chemistry. Prerequisite: Chemical Engineering 418.

571, 572. *Special Topics in the Chemistry of Animal Nutrition*. (2-6).

*Credit 4 each semester*.

Vitamins, amino acids, mineral contents of feeds, productive protein, and productive energy as related to animal nutrition.

The laboratory work is under Agricultural Experiment Station conditions and includes analysis of feeds, experiments, and a thesis on the chemistry of animal nutrition.

573, 574. *Special Topics in the Chemistry of Animal Nutrition*. (2-6).

*Credit 4 each semester*.

A continuation of course 571, 572.

575, 576. *Special Topics in the Chemistry of Soils*. (2-6). *Credit 4 each semester*.

The study of soil acidity, phosphoric acid, potash, and nitrogen related to crops, and similar topics by means of books, bulletins, original articles and the preparation of reports. The laboratory work accompanying the course will depend upon the experience of the student.

577, 578. *Special Topics in the Chemistry of Soils*. (2-6). *Credit 4 each Semester*.

A continuation of course 575, 576.

#### Chemical Engineering

##### FOR GRADUATES AND ADVANCED UNDERGRADUATES

409. *Gas and Oil Technology*. (3-6). *Credit 5*.

Application of chemistry and engineering to gas, natural gasoline, petro-

leum, and cotton seed oil. The laboratory work comprises the refining of petroleum and the production and refining of cotton seed oil. Prerequisite: Chemistry 302.

411. *Physical Chemistry*. (3-4). *Credit 4*.

Explanation and mathematical development of the theories and principles of chemistry. Topics discussed are atomic structure, gas laws, thermodynamics, thermochemistry, liquids, solutions, osmotic pressure, and colloids. Experiments in the laboratory substantiate the theories and principles developed in the classroom. Prerequisite: Chemistry 302 and Chemical Engineering 202.

414. *Sanitary Chemistry*. (3-4). *Credit 4*.

Sanitary examination of food, milk, and milk products, and the sanitary analysis of water, including water treatment methods. Methods of purification of water, as the use of sand filters, coagulants, and algicides; sources of pollution of water and milk supplies and their relation to public health; problems common to the sanitary chemist and the engineer. Prerequisite: Chemistry 206 or 302.

416. *Chemical Technology*. (3-4). *Credit 4*.

The application of chemical theories and laws to industrial processes, organic chemical processes being emphasized, especially those dealing with the refining of petroleum, cotton seed oil, and sugar. Prerequisite: Chemical Engineering 409.

418. *Physical Chemistry*. (3-4). *Credit 4*.

Intensive study of homogenous and heterogenous equilibria, the phase rule, chemical kinetics, catalysis, hydrogen-ion concentration, electrolytic and galvanic cells and electrochemistry, photochemistry, and radio activity. Prerequisite: Chemical Engineering 411.

419. *Petroleum Refining*. (3-0). *Credit 3*.

The application of chemical theories and laws to the refining of petroleum.

422. *Animal and Vegetable Oils*. (3-4). *Credit 4*.

Chemical examination of animal and vegetable oils with special reference to the detection of adulterants. Prerequisite: Chemistry 302.

#### FOR GRADUATES

503, 504. *Advanced Industrial Chemistry*. (2-6). *Credit 4 each semester*.

A study of industrial processes. Prerequisite: Chemistry 302.

509, 510. *Cotton Seed Oil*. (2-6). *Credit 4 each semester*.

A study of cotton seed oil production and refining. Prerequisite: Chemistry 302.



## CIVIL ENGINEERING

- J. J. Richey, C.E., *Professor and Head of the Department.*  
J. T. L. McNew, M.S., C.E., *Professor.*  
T. A. Munson, M.S., C.E., *Professor.*  
L. E. Grinter, Ph.D., *Professor.*  
C. E. Sandstedt, M.S., *Associate Professor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

311. *Hydraulics.* (3-0). *Credit 3.*

The laws governing the action of water at rest and in motion, as related to engineering problems; the flow of water in pressure mains, sewers, aqueducts, open channels, and in rivers; measurement of the flow of water by nozzles, orifices, weirs and meters; elements of the theory of pumps and water wheels; Prerequisite: Mechanical Engineering 212, or equivalent.

336. *Hydraulics Laboratory.* (0-2). *Credit 1.*

Calibration of nozzles, orifices, water meters, weirs, pressure gauges; measurement of pipe friction; measurement of pipe flow with Pitot instrument and Venturi meter; efficiency tests on impulse motor, hydraulic ram, and centrifugal pump; solution of assigned problems. Prerequisite: Civil Engineering 311 or registration therein.

340. *Elementary Structural Analysis.* (3-0). *Credit 3.*

Loads and reactions for simple structures; review of moment and shear in beams; influence lines for beams and trusses; algebraic and graphical methods for determining stresses in trusses. Prerequisite: Civil Engineering 305.

342. *Structural Drafting.* (0-4). *Credit 1.*

Application of graphical methods in solving reactions and stresses in simple structures; designing and detailing of structural members. Prerequisite: Civil Engineering 340 or registration in that course.

344. *Mechanics of Reinforced Concrete.* (2-0). *Credit 2.*

Theory of stress distribution in plain and reinforced concrete beams; derivation of working formulas for rectangular reinforced beams and T-beams; stress determination and elementary design of beams; theory, investigation, and design of reinforced columns. Prerequisite: Civil Engineering 305.

407. *Roads and Pavements.* (3-0). *Credit 3.*

A brief study of country roads and city pavements. Highway location, design, construction and maintenance; road laws, finances, organization and supervision briefly considered. The text is supplemented by lectures, the use of bulletins, models and samples of materials. Prerequisite: Civil Engineering 201, Mechanical Engineering 212.

414. *Reinforced Concrete Design.* (2-3). *Credit 3.*

A study of the design of various types of reinforced concrete structures,

such as buildings, bridges, retaining walls, culverts. Practice in the making of simple designs and working drawings. Prerequisite: Civil Engineering 344.

417. *Bituminous Materials.* (2-3). *Credit 3.*

Origin, production, specification, and tests of bituminous materials and mixtures used in the construction and maintenance of roads and pavements. Prerequisite: Senior classification in engineering.

423. *Structures.* (2-4). *Credit 3.*

Types of highway bridges; calculation of stresses; design of bridge floors; beam bridges; plate girders, high and low truss bridges; bridge details, deflections. The practice consists chiefly in making design computations and general drawings for a low riveted truss bridge in accordance with a given set of specifications. Prerequisite: Civil Engineering 340, 342.

443. *Materials of Construction.* (0-4). *Credit 1.*

A laboratory study of the suitability of various materials of engineering, including brick, stone, sand, gravel, cement, mortars, concrete. Prerequisite: Civil Engineering 407.

448. *Engineering Economy.* (3-0). *Credit 3.*

Comparison of engineering plants or projects on basis of first cost, ultimate economy comparisons involving depreciation, operating expense, etc.; accounting records and cost records; estimating costs. Prerequisite: Senior classification in engineering.

452. *Structural Engineering.* (2-3). *Credit 3.*

An introduction to the design of continuous structures of reinforced concrete and steel, such as rigid frame bridges and building frames. Laboratory checking of computed stresses by the use of celluloid models and deformation gauges; laboratory study of the variation of stress in hooks of reinforcing bars, in the plates at a welded joint, and in similar structural details, by the aid of the photo-elasticity polariscope and the strain gage. Prerequisite: Civil Engineering 423 or 455.

455. *Steel Buildings.* (2-3). *Credit 3.*

Structural features of mill buildings, office buildings, warehouses. Design of one of the foregoing types of buildings. Prerequisite: Civil Engineering 340, 342.

456. *Highway Administration and Design.* (2-3). *Credit 3.*

Study of highway laws, the administration of street and highway improvements, and the procedure followed in planning and executing municipal street improvements. Problems in pavement design. Prerequisite: Civil Engineering 407.

458. *Hydraulic Engineering.* (3-0). *Credit 3.*

An elementary study of the control and utilization of water resources for irrigation, power, and flood protection; correlation of rainfall and stream flow by means of isohyets and hydrographs; channel improvement, levee

design, detention basin operation; design of pumping plants and other hydraulic structures. Prerequisite: Civil Engineering 311.

461. *Masonry Construction.* (2-2). *Credit 3.*

Brick and stone masonry; cement and aggregates; theory of proportioning concrete; methods of mixing, placing, and curing for concrete; foundations; plain concrete structures, including dams, retaining walls, abutments, piers, culverts; forms and falsework. Problems in design and investigation of masonry structures. Prerequisite: Civil Engineering 305.

463. *Hydrology.* (3-0). *Credit 3.*

A study of the occurrences and measurement of precipitation and stream flow; relations between precipitation and run-off; estimating seepage, evaporation, run-off, storage, and flood discharges for drainage basins. Prerequisite: Civil Engineering 311.

FOR GRADUATES

525, 526. *Highway Construction and Materials.* (3-3). *Credit 4 each semester.*

Highway design and construction, including location, drainage, foundations, types, costs. Laboratory and field investigations of highway materials and pavement mixtures.

527, 528. *Hydraulic Engineering.* (3-3). *Credit 4 each semester.*

Advanced hydrology, water power development, flood control, irrigation.

531, 532. *Advanced Structural Analysis and Design.* (3-3). *Credit 4 each semester.*

Analysis of stress in rigid frames; secondary stresses; analysis of cantilever, suspension, and continuous bridge trusses. Design of reinforced concrete arch and building frame.

533, 534. *Advanced Mechanics of Materials.* (4-0). *Credit 4 each semester.*

Deflection of structures; internal stresses in members and details determined by mathematical analysis, mechanical methods, and study of test data.

541, 542. *Research.* *Credit 2 to 6.*

Technical research; project subject to approval of head of department.

DAIRY HUSBANDRY

C. N. Shepardson, M.S., *Professor and Head of the Department.*

A. L. Darnell, M.A., *Professor.*

E. W. Renner, M.S., *Associate Professor.*

FOR GRADUATES AND ADVANCED UNDERGRADUATES

407. *Ice Cream Making and Refrigeration.* (3-2). *Credit 4.*

Mixing and freezing ice cream, sherbets, and other frozen products and the physical principles involved; type of freezers; flavoring materials; fillers;

binders, ice cream standards; the theory and practice of artificial refrigeration and its use in the ice cream plant. Prerequisite: Dairy Husbandry 202.

409. *Selection and Breeding of Dairy Cattle.* (2-3). Credit 3.

Consideration of the selection of breeds, individual cows and herd sires; studies of prominent families and individuals in the major dairy breeds; dairy cattle breeding and other problems of the breeder. Prerequisite: Dairy Husbandry 417.

415. *Condensed Milk and Milk Powder.* (3-0). Credit 3.

The food value, manufacture and distribution of condensed and evaporated milk, milk powder, milk sugar, casein and other milk products; a study of milk substitutes. Prerequisite: Dairy Husbandry 301.

417. *History and Development of Dairy Cattle.* (3-2). Credit 4.

A general history of dairy farming and its place in a permanent system of agriculture; history, origin and classification of dairy cattle and dairy cattle breeds. Prerequisite: Dairy Husbandry 202, Genetics 301.

418. *Feeding and Management of Dairy Cattle.* (3-2). Credit 4.

The care, feeding and management of the dairy herd; calf raising, developing the dairy heifer, herd records and record keeping. Prerequisite: Animal Husbandry 303, Dairy Husbandry 202.

#### FOR GRADUATES

501, 502. *Advanced Dairy Production.* (2-6). Credit 4 each semester.

An advanced study of general production problems. Prerequisite: Dairy Husbandry 409, 417, and 418.

503, 504. *Advanced Dairy Manufactures.* (2-6). Credit 4 each semester.

An advanced study of general manufacturing problems. Prerequisite: Dairy Husbandry 301, 306, 407 and 415.

505, 506. *Research in Dairy Production.* (2-6). Credit 4 each semester.

A study of research methods and a review of scientific literature dealing with special dairy production problems. Students will select individual problems, subject to the approval of the head of the department. Prerequisite: Dairy Husbandry 409, 417, and 418.

507, 508. *Research in Dairy Manufacture.* (2-6). Credit 4 each semester.

A study of research and a review of scientific literature dealing with special dairy manufacturing problems. Students will select individual problems subject to the approval of the head of the department. Prerequisite: Dairy Husbandry 301, 306, 407, and 415.

#### ECONOMICS

F. B. Clark, Ph.D., *Professor and Head of the Department.*

I. G. Adams, A.M., *Assistant Professor.*

FOR GRADUATES AND ADVANCED UNDERGRADUATES

311. *Money and Banking.* (3-0). *Credit 3.*

The evolution of money, the various forms of credit, the history of banking institutions, banking in other countries, the Federal Reserve System, and current monetary and banking problems. Prerequisite: Economics 203, 204, or 403.

318. *Labor Problems.* (3-0). *Credit 3.*

Theories of wages, development of trade unions and labor unions, proposals for solution of labor problems, labor legislation, and other problems growing out of modern industrial development. Prerequisite: Economics 203, 204, or 403.

408. *Corporation Finance.* (3-0). *Credit 3.*

The common forms of business organizations with special attention to corporations; advantages and disadvantages of incorporation, formation and organization of corporations, capital stock and bonds, legal status of corporations, bankruptcy and reorganization.

409. *Foreign Trade and Exchange.* (3-0). *Credit 3.*

The principles of international commerce, methods of conducting foreign trade, and the theory and practice of foreign exchange.

412. *Public Finance and Taxation.* (3-0). *Credit 3.*

The purpose of the course is to give a working knowledge of public financial institutions and practices. Among the topics considered are: The amount and growth of public expenditures; the sources of revenue; budgetary methods; principles which should govern appropriations; public industries and price making; the principles of taxation; the important kinds of taxes; the principles of borrowing; the management of public debts.

413, 414. *Advanced Economy Theory.* (3-0). *Credit 3 each semester.*

This course is based on two assumptions, namely, (1) the nature of economic theory is such that maturity of judgment is essential to its comprehension, and (2) contact with practical economic problems is highly valuable in grasping economic concepts. The advanced course in economic theory, therefore, covers the same ground as that covered in other courses in economic principles but covers it more exhaustively. The course is open only to students who have had Economics 203, 204, or its equivalent, and in addition at least one course in applied economics.

416. *Public Utility Economics.* (3-0). *Credit 3.*

A general survey course examining: historical development; legal and economic principles; evolution in methods and types of regulation; financial policies; labor policies; taxation and rate-making; public ownership.

FOR GRADUATES

501, 502. *History of Economic Doctrines.* (4-0). *Credit 4 each semester.*

The purpose of this course is to study in detail, beginning with the Psysio-

crats, the growth of the science of economics. A careful study is made of the various schools of economists and an analysis is made of such fundamental concepts as production, value, capital, interest and profits as they have appeared from time to time in the writings of the leading economists. Gide and Rist's *History of Economic Doctrines* serves as a guide to these authorities.

505. *Public Finance*. (4-0). *Credit 4*.

An account of the evolution of financial systems; a chronological review of the discussion of the theories and principles of finance; a study of current theory and practice in public borrowing and levying, financial administration and expenditure of public revenues in the United States and the principal European countries.

506. *Labor Problems*. (4-0). *Credit 4*.

A historical survey of the evolution of labor movements and programs, with a critical examination of their underlying philosophies. The economic principles involved in the leading problems of labor and wages.

### ELECTRICAL ENGINEERING

M. C. Hughes, E.E., *Professor and Head of the Department*.

F. C. Bolton, M.S., *Professor*.

E. W. Markle, M.S., *Professor*.

N. F. Rode, M.S., *Professor*.

H. C. Dillingham, M.A., *Professor*.

L. L. Fouraker, M.S., *Associate Professor*.

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

302. *Alternating Currents*. (5-0). *Credit 5*.

The principles of alternating currents, including the relation of voltage, current, resistance, inductance and capacity. Prerequisite: Electrical Engineering 301, Mathematics 204.

405. *Electrical Transmission*. (3-0). *Credit 3*.

Lectures and recitations on the transmission of electricity by wires. The subject is treated by the use of hyperbolic functions and covers the fundamental principles of electric transmission which are applicable to either telephone or power transmission. Prerequisite: Mathematics 305, Electrical Engineering 302.

406. *Electrical Distribution and Transmission*. (2-2). *Credit 3*.

Lectures and recitations on the transmission and distribution of power by electrical methods, including the design and cost estimate of several transmission and distribution systems. Prerequisite: Electrical Engineering 405.

409. *Advanced Communication Engineering*. (2-3). *Credit 3*.

An introduction to radio engineering, including a basic study of radiation and radiation devices of thermionic tubes and their application in radio receiving and transmitting circuits.

410. *Electron Tubes.* (2-2). *Credit 3.*

An introduction to the theory and industrial application of electron tubes and devices, including thermionic, gaseous, light sensitive, and cathode ray tubes. The laboratory shall consist primarily of experimental studies of the performance characteristics of electron tubes.

416. *Motor Applications.* (3-0). *Credit 3.*

The determination of the proper sizes and types of motors to be applied in various industrial loads. Special emphasis is laid on the preliminary study of duty cycle and numerical calculation of starting duty and motor ratings. The study of industrial controllers. Prerequisite: Electrical Engineering 401 or 308.

425. *Illumination Engineering.* (2-2). *Credit 3.*

The principles of illumination; the design of lighting systems for buildings of various types. Tests of lighting units and of complete systems both for interior and exterior use. Prerequisite: Electrical Engineering 302 or 308 or 305.

426. *Illumination Engineering.* (2-2). *Credit 3.*

A study of the engineering principles used in telephone communication, including transmission theory, inductive interference, network and filters, loading, repeater and carrier systems. Laboratory investigations include transmission measurements on artificial lines and repeaters involving the use of vacuum tube measuring devices and impedance bridges. Prerequisite: Electrical Engineering 405.

431. *Engineering Administration.* (2-0). *Credit 2.*

A brief study of problems of engineering administration, including the law of contracts, records to be kept in engineering construction and operation, systems of organizations required. Prerequisite: Senior classification.

432. *Public Utility Problems.* (3-0). *Credit 3.*

The problems of operation of public utilities with particular attention to methods of organization, the fixing of rates, and the economic features of new lines and extensions. Prerequisite: Electrical Engineering 401, 431.

FOR GRADUATES

501, 502. *Advanced Alternating Currents.* (2-6). *Credit 4 each semester.*

The theory of transient phenomena; polyphase circuits; the study of transients with the oscillograph.

503. *Electrical Machine Design.* (1-3). *Credit 2.*

The design of electrical machines and the predetermination of their characteristics.

504. *Electrical Plant Design.* (1-3). *Credit 2.*

The design of power plants with special emphasis on the electrical machinery.

507, 508. *Advanced Alternating Current Machinery.* (2-6). *Credit 4 each semester.*

A study of the complicated alternating current machines.

509. *Advanced Communication Engineering—Telephone.* (3-3). *Credit 4.*

A study of the design and operation of telephone repeater and carrier systems, filters, networks, transmission measuring devices, telephoto and printer telegraph systems; laboratory investigation including transient and frequency characteristics of telephone lines, and transmission measurements on typical networks and lines.

510. *Advanced Communication Engineering—Radio.* (3-3). *Credit 4.*

A detailed study of the design and operation of audio amplification and radio frequency transmission systems with particular reference to radiating devices. Oscillographic studies and field strength measurements are the major laboratory investigations.

512. *Applications of Electrical Machinery to Industrial Operations.* (3-0). *Credit 3.*

A study of characteristics of electrical motors with special emphasis on their application to different types of loading, electrical control and the development of electrically operated drives, study of rate charges for service.

513, 514. *Public Utility Administration.* (4-0). *Credit 4 each semester.*

A study of the development of public service regulation by commission, status of public service corporation in the courts, the fixing of rate basis and analyses of methods used in determining cost of service, and other problems pertaining to Public Utility Administration.

516. *Acoustic Devices in Sound Reproduction Systems.* (3-3). *Credit 4.*

A detailed study of microphones and loud speakers with an introduction to the basic theory of vibrating systems, and a brief study of architectural and physiological acoustics incident to the proper application of sound reproducing systems. Laboratory work includes measurements of speakers and microphones and noise surveys and acoustic treatment of small auditoria.

517, 518. *Research in Electrical Engineering.* *Credit 2 to 6 each semester.*

Technical research projects approved by the head of the department.

## ENGINEERING RESEARCH

F. E. Giesecke, M.E., Ph.D., *Professor and Head of the Department.*

### FOR GRADUATES

501, 502. *Research Credit 2 to 6.*

Project subject to the approval of the head of the department.

503, 504. *Research.* (1-4). *Credit 2 each semester.*

Project relating to the heating of buildings.



## ENGLISH

Geo. Summey, Jr., Ph.D., *Professor and Head of the Department.*

\*W. H. Thomas, A.M., *Professor.*

D. B. Cofer, M.A., *Professor.*

T. F. Mayo, Ph.D., *Professor.*

S. S. Morgan, Ph.D., *Associate Professor.*

J. P. Abbott, A.B., *Assistant Professor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

307. *Technical Writing.* (2-0). *Credit 2.*

The composition of reports, recommendations, and scientific articles suitable for publication, with some opportunity for oral presentation. Prerequisite: English 203 or 210.

309. *The English Language.* (3-0). *Credit 3.*

A study of the history, vocabulary, syntax, and sounds of the English language. Prerequisite: English 231, 232, or 203, 210.

310. *Phonetics and Pronunciation.* (3-0). *Credit 3.*

A study of the formation of English sounds and usage of pronunciation. Prerequisite: English 231, 232, or 203, 210.

312. *Shakespeare.* (3-0). *Credit 3.*

The life, environment, and major dramatic works of Shakespeare. Prerequisite: English 231, 232, or 203, 210.

328. *American Literature Since 1870.* (2-0). *Credit 2.*

A study of recent American writing, chiefly prose, with attention to the intellectual and social movements reflected in the literature. Limited to students who have made an average grade of C in the prerequisite courses. Prerequisite: English 203 or 231.

413, 414. *Contemporary Literature.* (2-0). *Credit 2 each semester.*

A study of the most significant British and American novelists, poets, and dramatists from about 1890 to the present, with lectures on the social, political, economic, and intellectual backgrounds. Among the authors studied are Bernard Shaw, Samuel Butler, John Galsworthy, Rudyard Kipling, H. G. Wells, Sinclair Lewis, Joseph Conrad, Eugene O'Neill, and Edna St. Vincent Millay. Prerequisite: English 231, 232, or 203, 210.

415. *Contemporary Continental Drama.* (2-0). *Credit 2.*

A study of representative plays (in translation) by Ibsen, Strindberg, Hauptmann, Sudemann, Schnitzler, Maeterlinck, Rostand, Hervieu, Brieux, Benevente, and Pirandello. Prerequisite: English 231, 232, or 203, 210. (Not offered in 1934-1935).

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\*Deceased.

416. *Contemporary English Drama*. (2-0). *Credit 2*.

A study of representative plays by Pinero, Jones, Wilde, Galsworthy, Shaw, Barrie, Synge, Yeats, Lady Gregory, Dunsany, and O'Neill. Prerequisite: English 231, 232, or 203, 210. (Not offered in 1934-1935).

431. *The Novel*. (3-0). *Credit 3*.

Its origin and development and its reflection of life and personality. Readings, discussions, and research in English prose fiction from the romance of the sixteenth century through the great novels of the eighteenth and nineteenth centuries. Prerequisite: English 231, 232.

## ENTOMOLOGY

S. W. Bilzing, Ph.D., *Professor and Head of the Department*.

V. A. Little, M.S., *Associate Professor*.

H. G. Johnson, M.S., *Assistant Professor*.

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

301, 302. *Systematic Entomology*. (2-4). *Credit 3 each semester*.

A systematic study of the various orders of insects. The student has free access to the entomological library, which contains bound volumes of standard publications on entomology; and to a considerable insect collection for identification purposes.

305, 306. *Morphology*. (1-4). *Credit 2 each semester*.

The external and internal anatomy of insects; the exoskeleton, endoskeleton, mouth parts, wing venation, and other morphological characteristics of taxonomic value. The second term is devoted to the study of internal insect anatomy.

401, 402. *Advanced Economic Entomology*. (2-4). *Credit 3 each semester*.

For students who desire a knowledge of insect life histories, the physical and chemical properties of insecticides and their effects on insects, and methods of entomological research. Prerequisite: Entomology 201 and 301.

412. *Entomological Literature*. (3-0). *Credit 3*.

A summary of the most important works on the classification of insects; a survey of the entomological publications of the United States Department of Agriculture, and state experiment stations.

417, 418. *Spécial Problems*. (3-2). *Credit 4 each semester*.

The taxonomy, ecology, and biology of a specific family of insects; or the life history, anatomy or biology of some one insect. Prerequisite: Entomology 301, 302.

### FOR GRADUATES

501, 502. *Systematic Entomology*. (3-3). *Credit 4 each semester*.

A taxonomic study is made of the orders, families and sub-groups of the

class Hexopoda. The student is required to make a special study of some particular group.

503, 504. *Cotton Insects*. (3-3). *Credit 4 each semester*.

A detailed study of the life history of the most important insects affecting cotton; survey of the literature on this subject. The use of cultural methods, dusting and sterilizing machinery and insecticides is considered.

505, 506. *Advanced Apiculture*. (3-3). *Credit 4 each semester*.

A problem in apiary management or in the study of one or more of the diseases affecting bees; grading and marketing honey, foul brood laws, and methods of eradicating bee diseases.

507, 508. *Economic Entomology*. (3-3). *Credit 4 each semester*.

A detailed study of the most important economic pests. A comparison is made of the structure of insects belonging to the same group which attack our more important crops. Cultural methods, trap crops, insecticides, and fumigation.

509, 510. *Microtechnique*. (3-3). *Credit 4 each semester*.

A study of insect tissue; methods of making microscopic slides, making sections and staining tissues.

511, 512. *Research Entomology*. (3-3). *Credit 4 each semester*.

A study of the distribution of insects and the ecological relationship to their environment. Prerequisite: Taxonomic work.

513, 514. *Morphology*. (3-3). *Credit 4 each semester*.

Study of the morphological characteristics which are of taxonomic value, including wing venation, genitalia and other external characteristics.

## GEOLOGY

J. T. Lonsdale, Ph.D., *Professor and Head of the Department*.

F. A. Burt, M.S., *Associate Professor*.

F. E. Turner, Ph.D., *Assistant Professor*.

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

303, 304. *Petrology*. (3-4). *Credit 4 each semester*.

Rocks, their textures, mineral composition, chemical characters, classification, occurrence and origin. The laboratory work includes a study of hand specimens and microscopic study of thin sections of rocks and minerals. (Offered in 1934-1935 and alternate years thereafter). Prerequisite: Geology 202 and approval of head of department.

305, 306. *Paleontology*. (3-3). *Credit 4 each semester*.

An introductory study of the chief characteristics, successions and environmental conditions of the animal and plant life recorded in the rocks. The laboratory work includes field trips and the preparation and study of specimens. (Offered in 1934-1935 and alternate years thereafter). Prerequisite:

Geology 202, Biology 204, or equivalent, and approval of head of the department.

312. *Structural Geology.* (3-2). *Credit 4.*

The interpretation of rock structures caused by earth movements. The relation of rock structures to stratigraphic, physiographic and economic problems. Prerequisite: Approval of head of department.

419, 420. *Advanced General and Field Geology.* (3-4). *Credit 4 each semester.*

An advanced study of the principles of physical geology and stratigraphy. Theoretical and practical study of field methods of geological surveying. Laboratory work includes study of geologic maps and practice in surveying selected areas adjacent to the campus. (Offered in 1933-1934 and alternate years thereafter). Prerequisite: Geology 202, C.E. 206 and approval of head of department.

#### FOR GRADUATES

501, 502. *Advanced Mineralogy.* (3-3.) *Credit 4 each semester.*

A study of selected topics such as chemical relations, isomorphism, paragenesis, and synthesis of minerals applied to problems of petrology and mineral deposits. Mineralogic and petrologic technique.

503, 504. *Advanced Petrology.* (3-3). *Credit 4 each semester.*

Advanced petrographic-microscopic methods, microchemical reactions, petrogenesis, petrographic calculations, rock classification. Examination and description of well samples.

505, 506. *Special Geology.* *Credit 4 each semester.*

Advanced work along specialized lines for properly qualified students. May include independent investigation of problems in various phases of geology. Primarily a thesis course. Prerequisite: Approval of head of department.

507, 508. *Ore Deposits.* (3-3). *Credit 4 each semester.*

A study of the origin, classification, and exploitation of ore deposits. Open to properly qualified seniors.

509, 510. *Advanced Field Geology.* ((4-0). *Credit 4 each semester.*

Systematic geologic surveying of selected areas. The course is designed as a field basis for thesis for advanced degrees and will be varied to meet the needs of individual students.

#### HORTICULTURE

E. J. Kyle, B.S., B.S.A., M.S.A., *Professor and Head of the Department.*

G. W. Adrance, Ph.D., *Professor.*

F. R. Brison, M.S., *Associate Professor.*

FOR GRADUATES AND ADVANCED UNDERGRADUATES

317, 318. *Principles of Fruit Production.* (2-3). *Credit 3 each semester.*

Orchard management, including problems of location, soils, planting, cultivating, protection from insects and diseases, pruning, harvesting and marketing. Practice: Practical orchard work from planting to marketing. Prerequisite: Horticulture 201.

401. *Systematic Pomology.* (3-2). *Credit 4.*

Fruits, their identification, classification, distribution, importance and history; a detailed study of the more important species and varieties. Practice is given with such fruits as can be obtained during the season. Prerequisite: Horticulture 317, 318.

404. *Systematic Vegetable Crops.* (2-2). *Credit 3.*

The history, anatomy, taxonomy, breeding, seed production, and plant improvement of vegetable crops. The practice deals with a study of the actual plants as to type, variety, technique of breeding, selection of seed, taxonomy and anatomy of the various plants. Prerequisite: Horticulture 202, 310.

418. *Nut Culture.* (1-3). *Credit 2.*

Early history; distribution of native nuts; development of native groves to improved varieties. Practice: Budding and grafting pecans in the nursery row; top-working native pecans to improve varieties by means of budding and grafting; systematic study of the standard varieties of nuts; study of graft and bud unions. Prerequisite: Horticulture 201.

422. *Subtropical Fruits.* (3-2). *Credit 4.*

A study of subtropical fruits, with special attention to citrus fruits, figs, olives, and dates. Practice: Study of varieties of subtropical fruits and their products; propagation and care of the various subtropical fruits. Prerequisite: Horticulture 317, 318.

423. *Geography of Horticultural Industries.* (2-0). *Credit 2.*

A study of horticultural sections of the United States; with emphasis on producing centers in Texas; various fruits and vegetables considered with regard to point of origin and time of movement to market. Study of competition between domestic shipping centers as well as the influence of importations. Certain horticultural commodities considered with respect to the commercial varieties of different producing sections.

425. *History and Literature of Horticulture.* (2-0). *Credit 2.*

The development of the art and science of horticulture with emphasis on American horticulture. The men who have made outstanding contributions to the development of the various horticultural enterprises receive special attention. Books and periodicals which have influenced the trend of thought and practice in horticulture are also considered critically. A brief summary of the development of European horticulture will be followed by a careful study of the different eras in its development in America.

426. *Commercial Propagation. (2-3). Credit 3.*

Fundamental problems in propagation of horticultural plants, principally fruit trees and ornamentals. Physiological responses in rooting of stem and leaf cutting, including artificial treatments to stimulate rooting; morphology and physiology of graft unions; congeniality between stocks and scions; and adaptation of stocks to their environment. Commercial nursery practice, including methods of budding and grafting, and care of nursery stock after propagation. Commercial production of bulbs for planting will also be considered. Practice in laboratory and greenhouse, and in the College orchards.

#### FOR GRADUATES

501, 502. *Advanced Fruit Growing. (3-3). Credit 4 each semester.*

Problems of cultivation, fertilization, pruning, thinning of fruit and protection from frost and insect pests and diseases; the improvement of fruit by means of bud selection and breeding. Prerequisite: Horticulture 317, 318, or equivalent work.

503, 504. *Advanced Vegetable Gardening. (3-3). Credit 4 each semester.*

Recent developments in the production of vegetables for market and truck gardening purposes; irrigation; forcing plants for early market, and the development of plants by breeding and selection. Prerequisite: Horticulture 310, 404, 420, or equivalent work.

507, 508. *Horticultural Problems. (2-6). Credit 4 each semester.*

Various problems concerning recent developments in horticulture are considered, both in theory and in laboratory. Recent work at other stations is reviewed.

### INDUSTRIAL EDUCATION

E. L. Williams, M.S., *Professor and Head of the Department.*

E. W. Glenn, M.S., *Associate Professor.*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

406. *Vocational Guidance. (2-0). Credit 2.*

A survey of the recent development of educational and vocational guidance within and outside of the schools.

409. *Methods of Introducing Industrial Organization and Management into Industrial Schools. (2-0). Credit 2.*

A study of the history and development of industrial organization and management up to the present; most efficient methods; how these systems can best be adapted in industrial schools to make them more practical.

418. *General Shop Methods. (1-5). Credit 3.*

The student will organize material for general shop units and will practice those problems and projects which meet the requirements of the public school shop teacher.

422. *Social Economic and Educational Influences Affecting the Junior Worker.* (2-0). *Credit 2.*

A study of the supply and demand of workers in various occupations; pay and opportunities for advancement and their relation to society as a whole.

FOR GRADUATES

500. *A Practical Study of the Relation of Industry to Education.* (5-0).  
*Credit 5.*

This course is to be conducted during the summer only and as a tour of inspection and research. Advance arrangements will be made in the various cities with the directors of industrial education. The group will visit industrial schools, industries, and teacher-training institutions. Lectures will be given by men in each phase of work. Seminars will be held whenever possible en route. A final report will be required.

505. *Philosophy of Industrial Education.* (4-0). *Credit 4.*

The social, economic, and political necessities back of the movement for industrial education; the relation of industrial education to general education; types of courses to meet the demands of the community; the relations of industrial education to capital, labor, Americanization, and world competition in industry.

507. *Organization of Industrial Education Department.* (4-0). *Credit 4.*

Problems in making surveys, planning industrial departments for public schools and setting the proper organization.

508. *Administration and Supervision in Industrial Education.* (4-0).  
*Credit 4.*

Problems of the local director or supervisor of industrial education departments.

509, 510. *Methods of Teaching High School Drawing.* (2-4). *Credit 3 each semester.*

A survey of the field of drawing. The designing and organizing of problems and teaching devices. The first semester is devoted to general mechanical drawing as taught in the first two years of high school; the second semester to machine drawing. Either semester may be taken separately.

511. *Industrial Education Problems.* (4-0). *Credit 4.*

A study of current problems in Industrial Education. Research and organization of material to assist in the solving of individual problems.

512. *Methods of Training Employees in Commerce and Industry.* (3-0).  
*Credit 3.*

A study of the various methods used by commercial and industrial concerns to train workers for their respective needs. The aim of this course is to help teachers and supervisors analyze the training needs of local businesses; and organize courses for the preparation and improvement of their employees.

514. *Guidance Seminar.* (2-0). *Credit 2.*

The organization of occupational information; educational and vocational guidance; counseling case problems. Prerequisite: I. E. 406 or a similar course.

### LANDSCAPE ART

F. W. Hensel, M.S., *Professor and Head of the Department.*

#### FOR GRADUATES AND ADVANCED UNDERGRADUATES

401, 402. *Advanced Landscape Art.* (3-8). *Credit 6 each semester.*

The development of large areas, private estates, parks, subdivisions, cemeteries, and other private, and semi-private, and public properties. Major problems; landscape construction; detailed plans; professional practice. Prerequisite: Landscape Art 301, 304.

#### FOR GRADUATES

505, 506. *Landscape Design.* (2-12). *Credit 6 each semester.*

Advanced landscape problems; research consultations; criticism.

### MATHEMATICS

W. L. Porter, M.S., *Professor and Head of the Department.*

H. Halperin, E.E., A.M., *Professor.*

Nat Edmondson, Ph.D., *Associate Professor.*

J. H. Binney, Ph.D., *Associate Professor.*

#### FOR GRADUATES

503. *Theory of Equations.* (4-0). *Credit 4.*

504. *Solid Analytic Geometry.* (4-0). *Credit 4.*

505. *Vector Analysis* (4-0). *Credit 4.*

506. *Theory of Probability.* (4-0). *Credit 4.*

507, 508. *Theory of Functions of a Real Variable.* (4-0). *Credit 4 each semester.*

509, 510. *Advanced Calculus.* (3-0). *Credit 3 each semester.*

511. *Ordinary Differential Equations.* (4-0). *Credit 4.*

512. *Partial Differential Equations.* (4-0). *Credit 4.*

513, 514. *Differential Geometry.* (4-0). *Credit 4 each semester.*

515, 516. *Advanced Algebra.* (4-0). *Credit 4 each semester.*

517, 518. *Theory of Functions of a Complex Variable.* (4-0). *Credit 4 each semester.*

519. *Elliptic Integrals.* (3-0). *Credit 3.*



## MECHANICAL ENGINEERING

C. W. Crawford, M.S., *Professor and Head of the Department.*

A. V. Brewer, M.E., *Professor.*

V. M. Faires, M.S., M.E., *Professor.*

D. W. Fleming, B.S., *Instructor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

329. *Advanced Cabinet Making.* (1-6). *Credit 3.*

Advanced cabinet making, design, finishing, estimating, detailing, rod making, and one research problem on one of the above subjects, or any subject that deals with cabinet making and design as applied to a school shop. Prerequisite: Teaching experience in Cabinet Making, and courses equivalent to M. E. 105 and 106.

407. *Mechanical Refrigeration.\** (3-0). *Credit 3.*

The application of the principles of thermodynamics to mechanical refrigeration. Kinds of equipment and methods of practical production or refrigeration, ice making and cold storage. Prerequisite: Mechanical Engineering 320 or 323.

419, 420. *Industrial Engineering.* (3-0). *Credit 3 each semester.*

Principles of management as applied in modern industry; location and layout of factories, control of production, systems of wage payment, cost keeping, human relations. Prerequisite: Senior classification.

428. *Aerodynamics.\** (3-0). *Credit 3.*

The fundamental principles of airplane design and construction. Recent articles on current practice; research problems. Prerequisite: Mechanical Engineering 313.

430. *Production Engineering.* (2-2). *Credit 3.*

A study of the management and shop methods used in plants and factories whose output is largely the product of machine tools and similar equipment. Prerequisite: Mechanical Engineering 419; to be accompanied by Mechanical Engineering 420.

431. *Industrial Engineering Problems.* (0-2). *Credit 1.*

Sketches and drawings of plant layouts for selected problems; reports, materials and production scheduling. Must be preceded or accompanied by Mechanical Engineering 419.

### FOR GRADUATES

503, 504. *Power Plants.* (2-6). *Credit 4 each semester.*

The design of central and isolated power plants with special attention to over-all economic operation.

507, 508. *Experimental Engineering Research.* (1-8). *Credit 4 each semester.*

Methods and practice in mechanical engineering research, taking up

extended problems specially chosen to meet the needs of the individual student.

513. *Kinetics and Dynamics of Machines.* (4-0). Credit 4.

Velocities and accelerations, with particular emphasis upon balancing and vibrations.

515. *Advanced Engineering Thermodynamics.* (4-0). Credit 4.

An extended study of the theories of thermodynamics and their application to the more involved problems in engineering practice. Prerequisite: Mechanical Engineering 320.

## MUNICIPAL AND SANITARY ENGINEERING

E. W. Steel, C.E., *Professor and Head of the Department.*

### FOR GRADUATES AND ADVANCED-UNDERGRADUATES

401. *Sewage and Sewage Disposal.* (3-0). Credit 3.

Determination of the quantity of storm water and domestic sewage; design and construction of sewer systems; principles of sewage treatment; methods of treatment; operation of sewage disposal plants. Prerequisite: Civil Engineering 311.

402. *Water Supply and Purification.* (3-0). Credit 3.

Development of ground and surface water supplies; principles and methods of water purification; design, construction and operation of water-works systems for municipalities. Prerequisite: Civil Engineering 311, or registration in that course.

403. *Sanitary Design.* (1-5). Credit 3.

Practical problems in the design of sewer systems and appurtenances; sewage treatment plants; water collection and distribution systems; water purification plants. Prerequisite: Municipal and Sanitary Engineering 401 or 402 or registration in either of these courses.

406. *Sanitation and Public Health.* (3-0). Credit 3.

Relation of sanitation to public health; municipal sanitary work, including garbage and refuse disposal; plumbing; control of food supplies; mosquito; fly and rodent control; sanitation of swimming pools and tourist camps; organization of health departments. Prerequisite: Junior classification.

408. *Municipal Administration.* (3-0). Credit 3.

City government, including the city manager plan; relation of city to state; administration of city departments; public utilities; city planning. Prerequisite: Junior classification.

412. *Sanitary Laboratory.* (1-5). Credit 3.

Field and laboratory work in control and operation of sewage and water treatment plants and investigation of stream pollution. Prerequisite: Municipal and Sanitary Engineering 401 or 402.

#### FOR GRADUATES

501, 502. *City Management*. (4-0). *Credit 4 each semester*.

Development of European and American cities, forms of city government, functions of the city manager; administration of municipal affairs; organization of city departments; city finances; public utilities; fire prevention and protection; police administration; parks and playgrounds; public health and welfare; housing; city planning.

503, 504. *Sanitary Engineering*. (4-0). *Credit 4 each semester*.

Principles and methods of sewage treatment; principles and methods of water purification; recent developments in the treatment of water and sewage; garbage and refuse collection and disposal; mosquito control; sanitation and public health.

505, 506. *Research*. *Credit 2 to 6*.

Research; projects in sanitary engineering and municipal affairs subject to the approval of the head of the department.

#### PETROLEUM ENGINEERING

Harold Vance, B.S., *Professor and Head of the Department*.

Albert B. Stephens, M.S., *Associate Professor*.

401. *Oil Measurements and Transportation*. (2-3). *Credit 3*. I

The measurement, sampling and testing of crude oil, tank strapping and preparation of tank tables, oil storage, the prevention of loss by evaporation, fire and lightning protection. A study of the principles of pipe line design and construction. Prerequisite: Petroleum Engineering 303, 304.

402. *Oil Field Management*. (3-0). *Credit 3*.

The management of oil field properties, taxes and insurance, organization, regulation and valuation of oil and gas properties. Prerequisites: Petroleum Engineering 303, 304, 401, and 405.

406. *Natural Gas and Gasoline*. (2-3). *Credit 3*.

Theory and practice of gas measurement, orifice meters, positive displacement meters, Pitot tubes, orifice well testers, etc. The transportation of gas and the manufacture of natural gasoline. Prerequisite: Petroleum Engineering 303, 304.

#### FOR GRADUATES

501, 502. *Petroleum Engineering Problems*. (3-3). *Credit 4 each semester*.

An advanced course in Petroleum Engineering problems, with special reference to the application and design of equipment.

#### PHYSICS

Oscar W. Silvey, Ph.D. *Professor and Head of the Department*.

E. E. Vezey, M.S., *Associate Professor*.

I. C. Sanders, M.A., *Associate Professor*.

E. G. Smith, M.S., *Assistant Professor*.

W. H. McCorkle, Ph.D., *Assistant Professor*.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

301. *Heat.* (3-3). *Credit 4.*

Heat transfer, kinetic theory, critical points, isothermal and adiabatic changes and the thermodynamics of the changes of state and radiation. Prerequisite: Physics 202, 204, or 208, and Mathematics 204.

(Offered in 1935-36 and alternate years thereafter.)

302. *Properties of matter.* (3-3). *Credit 4.*

Universal gravitation, elasticity, surface tension, diffusion, viscosity and the mechanics of fluids. Prerequisite: Physics 202, 204 or 208, and Mathematics 204.

(Offered in 1935-36 and alternate years thereafter.)

305. *Light.* (2-0). *Credit 2.*

The wave theory of light, optical instruments, dispersion, spectroscopy, aberrations, refractions, interference, diffraction, polarization, double refraction and theories of refraction and reflection. The treatment is non-mathematical. Prerequisite: Physics 202, 204, or 208.

401. *Optics.* (3-3). *Credit 4.*

Periodic motion, wave motion, the nature and propagation of light, interference, polarization and the theory of optical instruments. Prerequisite: Physics 202, 204, or 208, and Mathematics 204.

(Offered in alternate years. Not offered in 1935-36.)

402. *Electricity and Magnetism.* (3-3). *Credit 4.*

Electric fields, potential, capacitance, current, resistance, electrolysis, primary and secondary cells, thermoelectric phenomena, magnetism, electromagnetic induction, electronics and Roentgen rays. Prerequisite: Physics 202, 204, or 208, and Mathematics 204.

(Offered in alternate years. Not offered in 1935-36.)

407. *Geophysics and Geophysical Methods.* (3-0). *Credit 3.*

A study of the earth's gravitational, magnetic, electrical, elastic and thermal properties and the various methods of geophysical prospecting. The effects of various types of deposits upon each method are shown with the object of determining, from an analysis of structural and lithologic conditions, the type of geophysical method most suitable in any particular area.

Prerequisite: Physics 202, or 204, and Mathematics 203, 204; or senior standing in Geology or Petroleum Engineering.

409. *Theoretical Acoustics.* (3-0). *Credit 3.*

A study of the fundamental theory of acoustic sound waves; theory of horns, including relations between acoustic and electrical impedance; acoustic transmission; acoustic measurements and instruments; atmospheric acoustics. Prerequisite: Mathematics 203, 204, 305.

#### FOR GRADUATES

501, 502. *Analytical Mechanics*. (4-0). *Credit 4 each semester*.

A study of rectilinear motion, plane and solid motion of a point, plane and solid rotational motion, mechanisms, strains, kinetics of a particle, kinetics of a rigid body, statics, attraction and potential, plane and solid of a rigid body, hydro-statics and hydro-kinetics.

503, 504. *Advanced Electricity and Magnetism*. (4-0). *Credit 4 each semester*.

A study of the underlying principles of alternating electric currents, the development of graphical methods of analysis as a basis for the solution of practical problems. The development of the equations for the propagation of an electromagnetic disturbance through a dielectric. A study of electrostatic and electromagnetic fields, the electromagnetic theory of light, thermal and electrical conduction in magnetic fields.

505, 506. *Theory of Thermodynamics and Thermal Radiation*. (4-0). *Credit 4 each semester*.

An advanced course in thermodynamics and thermal radiation including Planck's thermodynamical basis of the quantum theory, the quantum theory of specific heats, Gibbs' phase rule, Nernst's heat theorem, radiation, spectra, chemical equilibrium and affinity, modern theories of osmotic pressure, properties of solutions and voltaic cells.

507. *Kinetic Theory*. (4-0). *Credit 4*.

A study of gas pressure, speed of gaseous molecules. Boyle's law, the law of Gay-Lussac, Graham's Law, mean free path, coefficients of diffusion and viscosity, Maxwell's distribution law, Vander Waal's equation and Brownian movements. Open to undergraduate students who have a grade of A or B in Physics 301, 302.

508. *Electron Theory*. (3-0). *Credit 3*.

A study of the conductivity of electricity through gases, mobility and diffusion of gaseous ions, measurement of the elementary electric charge, ratio of charge to mass of ions, positive ions and photo-electric action. Open to undergraduate students who have a grade of A or B in Physics 301, 302.

510. *Electron Theory*. (0-3). *Credit 1*.

This course may be taken by students who are enrolled in Physics 508 and those who have credit in this course or its equivalent.

511, 512. *Advanced Optics*. (4-0). *Credit 4 each semester*.

The electromagnetic theory of light, spherical and chromatic aberrations, interference, diffraction, crystal optics, optical properties of metals, emission, absorption, dispersion and dispersion formulae, resonance; line and band spectra and their use in the study of the nature of atoms and molecules.

## POULTRY HUSBANDRY

Duncan H. Reid, M.S., *Professor and Head of the Department.*

W. F. Munnerlyn, M.S., *Assistant Professor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

#### 302. *Feeding and Brooding.* (3-2). *Credit 4.*

Common grain mill feeds for poultry, chemical composition, vitamin content and values as poultry feeds, embryology of the chick and introduction to brooding from a commercial standpoint. The practice includes methods of balancing poultry rations, different methods of determining the value of feeds, identifying and mixing poultry feeds, anatomy of the common fowl, identification of digestive and egg production organs. Prerequisite: Poultry Husbandry 201.

#### 401. *Culling and Management.* (3-2). *Credit 4.*

The underlying principles of poultry culling, study of the literature, management of large poultry flocks on commercial poultry farms, selecting the breeding stock qualities of a good breeding male. The practice includes a study of the relationship between physiological characteristics and egg production of the domestic fowl, the standard type, weight and qualities of standard domestic fowls. Prerequisite: Poultry Husbandry 201.

#### 402. *Poultry Farming.* (3-2). *Credit 4.*

The laying out of poultry farms, cost and management in raising a flock of one thousand or more, types of houses, incubators and brooders, raising of special types of poultry, battery brooding methods, teaching and demonstrating plans. The Practice consists of problems in organizing, financing and establishing a commercial poultry business. Prerequisite: Poultry Husbandry 201.

### FOR GRADUATES

#### 501, 502. *Research Problems.* (3-4). *Credit 4 each semester.*

A study of recent investigations in poultry breeding and nutrition. Research methods are given attention. Experiment station literature, scientific journals and newer publications are to be read and reported by the student.

#### 503, 504. *Advanced Incubation and Brooding.* (3-4). *Credit 4 each semester.*

Factors underlying the successful hatching of eggs. A study of the effects of various chemicals and disinfectants on the hatching of hens' eggs. Peculiar requirements of hatching eggs from different species of domestic fowl,—chickens, ducks, geese, turkeys and guinea fowl. Nutritive requirements of the young of the different species of domestic fowl. Optimum percentage of proteins and other nutrients in the ration. The vitamins necessary for growth; vitamins necessary to avoid malformation and to secure good growth; minerals essential to good growth. Results of vitamins deficiency in rations.

(These two courses are carried on in cooperation with the Department of Chemistry).

505. *Embryology of the Chick.* (2-6). *Credit 4.*

A microscopic study of the changes which take place in the egg during the period of incubation; methods of changing the rate of development of the embryo.

## RURAL EDUCATION

W. L. Hughes, M.S., *Professor and Head of the Department.*

George B. Wilcox, A.M., *Professor.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

321. *Secondary School Methods.* (3-0). *Credit 3.*

Methods of teaching high school subjects; for students who expect to teach in city high schools.

322. *Secondary School Administration.* (3-0). *Credit 3.*

The administrative problems of the city superintendent; for teachers who expect to administer school systems.

422. *History of Education.* (3-0). *Credit 3.*

The history of modern education, with special attention to the history of education in the United States.

426. *Tests and Measurements.* (3-0). *Credit 3.*

A study of the use of intelligence and achievement tests in administration and supervision of public schools. Prerequisite: Junior or Senior standing.

428. *Junior High School Methods.* (3-0). *Credit 3.*

This course will introduce the student to the modern practices of teaching in the Junior High School. Prerequisite: Rural Education 323.

430. *Curriculum Construction.* (3-0). *Credit 3.*

Problems and lectures in revising and adjusting the public school curriculum to meet the needs of modern society. Prerequisite: Junior or Senior standing.

### FOR GRADUATES

501. *Problems in Rural Education.* (4-0). *Credit 4.*

The rural school problem in the United States, including problems in related fields.

502. *Problems in Rural School Administration.* (4-0). *Credit 4.*

Organization, supervision, and administration of rural schools.

503. *Problems in Elementary Education.* (4-0). *Credit 4.*

Present tendencies, forms or organization, the curricula, management, selection of subject matter, and teaching children how to study. Offered in summers only.

504. *Development of Public School Education in Texas.* (4-0). *Credit 4.*

The origin and development of public school education in Texas.

505. *Principles of Educational Administration.* (4-0). *Credit 4.*  
The administration of state and county school systems.
506. *Principles of Educational Administration.* (4-0). *Credit 4.*  
The problems of the city superintendent of schools.
507. *Principles of City School Supervision.* (4-0). *Credit 4.*  
Types of supervision and the organization of supervisory programs. Tests and measurements in relation to supervision. Problems and lectures.
508. *Problems in Public School Support.* (2-0). *Credit 2.*  
A study of all types of school funds, and their relation to school efficiency. Problems and lectures.
509. *Curriculum Construction.* (3-0). *Credit 3.*  
Problems and lectures in adjusting the public school curriculum to the modern philosophy of education.
510. *Child Accounting.* (2-0). *Credit 2.*  
Devices to record and improve census taking and attendance; classification and promotional schemes; school record systems; school reports and pupil appraisal studies; grading, promotion, and eliminations; child accounting as affecting school efficiency.
511. *The Newer Techniques of Teaching.* (4-0). *Credit 4.*  
A critical evaluation of the more recent plans and techniques of teaching as regards motivation, pupil participation, philosophy of education, and the desirable outcomes of teaching. Problems and lectures.

## RURAL SOCIOLOGY

Daniel Russell, A.M., *Professor and Head of the Department.*

### FOR GRADUATES AND ADVANCED UNDERGRADUATES

311. *Social Psychology.* (3-0). *Credit 3.*  
The factors affecting group behavior together with methods of social control; the forces and influences which determine the mental attitudes of country people; the connection between a good understanding of the social mind and successful organization effort; methods of dealing with the problems involved; the many questions related to public opinion.
312. *General Sociology.* (3-0). *Credit 3.*  
The position of sociology among the social sciences. The subject matter of sociology is outlined under the following heads: population, physical environment, human motivation, social organization and social pathology. Emphasis is placed upon methods of investigation and quantitative measurement of the data of sociology.
404. *Rural Organization.* (3-0). *Credit 3.*  
A study of community life in the rural districts with its natural organizing and disorganizing tendencies; a survey and evaluation of attempts at community organization, as the survey, community club plan, community



council plan, the school community center, the community church, the Y. M. C. A., the Red Cross in rural districts.

407. *Rural Sociology*. (2-2). *Credit 3*.

An analysis of the conditions, forces and agencies influencing the life of the country dweller and the country community; a detailed study of a number of special problems related to the social side of country life, such as population questions; cityward drift; town and country relationships; rural health problems, recreation, rural leadership; community organizations and community planning. Attention is also given to the social problems connected with the home, the school, the church, the press and other social institutions.

FOR GRADUATES

501, 502. *Advanced Rural Sociology*. (4-0). *Credit 4 each semester*.

An intensive study of some important aspects of the field of rural sociology. The first term is connected mainly with the evolution of rural society; the second term with an analysis of some of the principles of rural social problems of today and proposed solutions.

511. *History of Modern Social Thought*. (4-0). *Credit 4*.

A study of the history, basis, and foundation of modern systems of thinking, as to authors who advance the theories, and as to different theories themselves. Special emphasis is placed on the study of the mental attitudes of the farmers on social, political, and economic questions.

512. *The Rural Community*. (4-0). *Credit 4*.

A study of the rural community as to its geographic background, population, social institutions, and occupational attitudes. Different efforts at organizing the rural community, as the county public welfare project, school and church community center projects, recreational and health projects, local, state and national agencies for rural community co-operation are studied.

TEXTILE ENGINEERING

J. B. Bagley, B.A., *Professor and Head of the Department*.

J. G. Powers, *Assistant Professor*.

FOR GRADUATES AND ADVANCED UNDERGRADUATES

413, 414. *Cotton Classing*. (1-3, 0-3). *Credit 2, 1*.

Recitations and lectures on classification and stapling of cotton, buying spot cotton, papers used in the cotton trade and cotton exchanges.

VETERINARY ANATOMY

Mark Francis, D.V.M., LL.D., *Professor and Head of the Department*.

FOR GRADUATES

511, 512. *Veterinary Anatomy*. (2-4). *Credit 3 each semester*.

## VETERINARY MEDICINE AND SURGERY

R. P. Marsteller, D.V.M., *Professor and Head of the Department.*

R. C. Dunn, D.V.M., *Professor.*

A. A. Lenert, B.S., D.V.M., *Associate Professor.*

### FOR GRADUATES

501, 502. *Special Surgery. (2-4). Credit 3 each semester.*

Problems of surgical conditions, surgical pathology, surgical technique and sterility of animals.

## VETERINARY PATHOLOGY

A. E. Wharton, D.V.M., *Associate Professor.*

### FOR GRADUATES

541, 542. *Advanced Special Pathology. (3-4). Credit 4 each semester.*

Etiology, pathogenesis, lesions and results of diseases of organs and systems of organs; pathology of infectious diseases. Prerequisite: Veterinary Pathology 242, or equivalent.

543, 544. *Advanced Special Bacteriology. (3-4). Credit 4 each semester.*

A study of pathogenic micro-organisms; their cultural and biological characteristics and pathogenicity. Prerequisite: Biology 206.

## VETERINARY PHYSIOLOGY AND PHARMACOLOGY

Patton W. Burns, B.S., D.V.M., *Associate Professor.*

### FOR GRADUATES

501, 502. *Advanced Practical Physiology. (2-4). Credit 3 each semester.*

Recent phases of physiology; modern experimental methods. The work is arranged to suit the needs of the student and in harmony with his previous training.

503, 504. *Advanced Physiology of Nutrition. (2-4). Credit 3 each semester.*

A detailed study of the modern theories of nutrition with special reference to vitamins.

505, 506. *Advanced Poisonous Plants. (2-4). Credit 3 each semester.*

Original investigations and detailed studies of the poisonous plants affecting domestic animals.

507, 508. *Advanced Experimental Pharmacology. (2-4). Credit 3 each semester.*

Modern methods of research in pharmacology and pharmaceutical processes. Original research in studying the actions and uses of drugs.

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