SHORT COURSE

IN

HIGHWAY ENGINEERING

JANUARY 10-21, 1916.

Under the Direction of the Civil Engineering Department
College of Engineering

PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA
SHORT COURSE IN HIGHWAY ENGINEERING.

PURPOSE OF THE COURSE.

This course is intended to help men who are interested in the building and maintenance of roads. It has for its object the diffusion of information concerning the principles and the discussion of the latest improvements in this important work for the public benefit. It is hoped to bring together some of the men who have been doing things, and to make available, to all persons who can attend, the results of the latest and best experience in road building. The course is open to all persons whether engineers or not. It should be of particular interest and value to county superintendent of highways, township highway commissioners, city engineers, contractors, and others who in their official duties or private practice have occasion to plan or work upon country or city roads. It is intended also to disseminate information concerning construction and maintenance of bridges, culverts, drains and similar structures which are necessary for the best use of the highways. The addresses and demonstrations will be of value to all persons who have occasion to build or repair roads whether as engineer, contractor or foreman. All who are interested in road improvement are invited.

It is not expected that the product of the Short Course will be experienced, efficient road engineers; but it is believed that even experienced civil engineers who have not made a specialty of road engineering may receive valuable help. It is believed also that men without experience in general engineering or in road work may receive important suggestions concerning road and bridge construction.
CONDITIONS OF ADMISSION

There will be no charges of any kind by the University. The course will be open to any one without examination or other condition, except to register in Room 221, Engineering Building.

ROOM AND BOARD

The residences and rooming houses near the University in Urbana and Champaign will be canvassed for information concerning room and board for those who attend the Short Course in Highway Engineering. The data thus collected will be in the hands of the Employment Bureau of the Y. M. C. A. in its building adjoining the campus, and may be consulted by any one. The street cars between Urbana and Champaign run near all the railroad stations in both cities; and the Y. M. C. A. building may be reached on the street cars, either directly or by transfer.

MAIL

Mail or prepaid telegrams addressed to 201 Engineering Building, Urbana, will be promptly distributed to persons attending the Short Course.

GENERAL DISCUSSION.

It is expected that all those presenting technical papers will allow time at the conclusion for a general discussion of the subject; and it is hoped that all will avail themselves of this opportunity.

Please bring this program with you.
PROGRAM

MONDAY, JANUARY 10, 1916.

Room 221 Engineering Building.

AFTERNOON SESSION.

2:00 P. M. Registration.

3:00 P. M. Prof. F. H. Newell, Head of Civil Engineering Department, Presiding.

Address of Welcome.
Edmund Janes James, LL.D., Ph.D.
President of the University.

W. F. M. Goss, D. Eng'g.
Dean of the College of Engineering.

4:00 P. M. Social Hour.

EVENING SESSION.

Dean W. F. M. Goss, Presiding.

7:30 P. M. U. S. Reclamation Service and Highways (Lecture illustrated by colored lantern slides).
Dr. F. H. Newell,
Former Director of U. S. Reclamation Service.
TUESDAY, JANUARY 11, 1916.

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 20.
Sec. B. Roads, Room 220. For Program see page 17.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 17.
Sec. B. Bridges, Room 219. For Program see page 20.

AFTERNOON SESSION.

Room 221, Engineering Building.
Prof. I. O. Baker, Presiding.
1:00 P. M. Maintenance of Earth Roads.........W. S. Gearhart
State Engineer of Kansas.
2:00 P. M. The Need of Balance in a System of Roads
H. E. Bilger
Road Engineer, Illinois Highway Department.
3:00 P. M. Oiling Clay, Gumbo, and Sand Roads
W. S. Gearhart
State Engineer of Kansas.

EVENING SESSION.

Room 221, Engineering Building.
Dean E. Davenport, Presiding.
7:30 P. M. Effect of Roads upon Rural Life
Dr. R. E. Hieronymus
Community Advisor, University of Illinois.
WEDNESDAY, JANUARY 12, 1916.

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 20.
Sec. B. Roads, Room 220. For Program see page 17.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 17.
Sec. B. Bridges, Room 219. For Program see page 20.

AFTERNOON SESSION.

Room 221, Engineering Building.
Prof. F. H. Newell, Presiding.
1:00 P. M. Effect of Illinois State-Aid Road Law, W.W. Marr
Chief State Highway Engineer of Illinois.
2:00 P. M. Road Management.......................... Dr. L. I. Hewes
Chief of Economics and Maintenance, U. S.
Office of Public Roads and Rural Engineering,
Washington, D. C.
3:00 P. M. Room 100 Chemistry Building.
Properties of Oils, Tars and Asphalts (Demon-
stration Lecture)............................ S. W. Parr
Professor of Applied Chemistry.

EVENING SESSION.

Room 221, Engineering Building.
Dean K. C. Babcock, Presiding.
7:30 P. M. Illustrated Lecture: Construction of Macadam
Roads........................................ Dr. L. I. Hewes
Chief of Economics and Maintenance, U. S.
Office of Public Roads and Rural Engineering,
Washington, D. C.
THURSDAY, JANUARY 13, 1916.

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 20.
Sec. B. Roads, Room 220. For Program see page 17.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 17.
Sec. B. Bridges, Room 219. For Program see page 20.

AFTERNOON SESSION.

Room 221, Engineering Building.
Prof. A. B. McDaniel, Presiding.

1:00 P. M. Earth Handling Machinery..................C. R. Thomas
Formerly Assoc. Editor Engineering and Contracting, Chicago
2:00 P. M. Oiled Earth Roads..........................B. H. Piepmeier
Maintenance Engineer, Illinois Highway Department
2:00 P. M. General Discussion. (a) Success of Road Day;
(b) Co-operation of Chambers of Commerce,
Automobile Clubs, etc., in Road Building; (c)
Stimulating Interest in Better Roads.

EVENING SESSION.

Room 221, Engineering Building.
Prof. S. W. Parr, Presiding.

7:30 P. M. Asphallic Highway Construction (Lecture Illus-
trated with moving pictures).
W. P. Blackwood,
Barber Asphalt Paving Co.
FRIDAY, JANUARY 14, 1916.

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 21. Sec. B. Roads, Room 220. For Program see page 18.

10:00 A. M. Sec. A. Roads, Room 220. For Program see page 18. Sec. B. Bridges, Room 219. For Program see page 21.

AFTERNOON SESSION.

Room 221, Engineering Building.

Prof. J. E. Smith, Presiding.

1:00 P. M. Road Making Machinery—Its Use and Maintenance.................................................. T. R. Agg, Professor of Highway Engineering, State College, Ames, Iowa.

2:00 P. M. General Discussion. Safety first in Highway Structures: Railway and Highway Grade Crossings, Road Signs, Guard Rails, etc.

3:00 P. M. Choice of Type of Road and Principles of Design. T. R. Agg, Professor of Highway Engineering, State College, Ames, Iowa.

EVENING SESSION.

Room 221, Engineering Building.

Director F. W. DeWolf, Presiding.

7:30 P. M. Use of Petroleum Products in Road Work (Lecture illustrated with samples of oil).

James A. Cannon, National Refining Co., Cleveland, Ohio.
SATURDAY, JANUARY 15, 1916.

MORNING SESSION.

Room 221, Engineering Building.

Prof. W. M. Wilson, Presiding.

8:00 A. M. Economics of Bridge Floors..........Clifford Older Bridge Engineer, Illinois Highway Dept.

9:00 A. M. Shall the County Buy Road Building Machinery? G. N. Lamb, Superintendent of Highways, Kane County.

10:00 A. M. Laboratory Demonstrations:

Sec. A, in Road Laboratory. Rattler Test of Paving Brick and Tests of Road Stone.

B. L. Bowling, Assistant in Road Laboratory.

C. C. Wiley, Instructor in Highway Engineering.

Sec. B, in Room 221. Tests of Sand and Gravel.

N. B. Garver, Instructor in Highway Bridge Engineering.

AFTERNOON SESSION.

Inspection of the University.

1:30 P. M. Test of Monolithic Brick Pavement Slabs, in T. and A. M. Laboratory.

2:00 P. M. Engineering Buildings.

3:00 P. M. Natural History Building.

3:15 P. M. Agricultural Group.

3:30 P. M. Work of the College of Agriculture, Morrow Hall, Agriculture Building.
SUNDAY, JANUARY 16, 1916.

11:00 A. M. Rev. J. C. Baker, Pastor of Trinity Methodist Episcopal Church extends a cordial invitation to all non-residents attending the Short Course to worship in the above church, which adjoins the campus. Seats will be reserved in a body. Those who desire to accept this invitation are asked to meet in Room 221, Engineering Building, at 10:30 a. m., and proceed together to the church.

2:30-3:00 P. M. Visit Museum of Classical Archaeology, Room 402, Lincoln Hall.......Prof. A. S. Pease Curator.

3:15-3:45 P. M. Visit Museum of European Culture, Room 401, Lincoln Hall............Prof. N. C. Brooks Curator

4:00 P. M. Attend Pipe Organ Recital, Auditorium.

Prof. J. L. Erb
Director of the Department of Music, Organist
MONDAY, JANUARY 17, 1916

MORNING SESSION.
8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 21.
Sec. B. Roads, Room 220. For Program see page 18.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 18.
Sec. B. Bridges, Room 219. For Program see page 21.

AFTERNOON SESSION
Room 221, Engineering Building.
Prof. I. O. Baker, Presiding.
1:00 P. M. Relation of the County Superintendent of Highways to the Township Road Commissioners
L. B. Neighbour, County Superintendent of Highways, Lee County.
3:00 P. M. Laboratory Demonstration.
B. L. Bowling, Ass't. in Cement Laboratory.
C. C. Wiley, Instructor in Highway Eng'g.
3:30 P. M. Laboratory Demonstration.
B. L. Bowling, Ass't in Cement Laboratory.
C. C. Wiley Instrutor in Highway Engineering.
Sec B, in Room 221. Tests of Tars, Asphalts and Oils.
F. L. Roman, Testing Engineer, Illinois Highway Department.

EVENING SESSION.
Room 221, Engineering Building.
7:30 P. M. Highways and Waterways (Lecture illustrated with colored lantern slides.
Dr. F. H. Newell, Professor of Civil Engineering.
TUESDAY, JANUARY 18, 1916

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 21.
Sec. B. Roads, Room 220. For Program see page 18.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 18.
Sec. B. Bridges, Room 219. For Program see page 21.

AFTERNOON SESSION.

Room 221, Engineering Building.
Prof. C. A. Ellis, Presiding.
1:00 P. M. Wisconsin Highway Standards..........A. R. Hirst
State Highway Engineer of Wisconsin.
2:00 P. M. Creosoted Timber in Highway Construction
A. L. Keuhn
General Superintendent American Creosoting Co.
3:00 P. M. Road and Bridge Construction in Wisconsin (Illustrated lecture)...............A. R. Hirst
State Highway Engineer of Wisconsin

EVENING SESSION.

Room 221, Engineering Building.
Vice President David Kinley, Presiding.
7:30 P. M. Use of Coal Tar in Highways (Illustrated by moving pictures)..............Philip P. Sharples
WEDNESDAY, JANUARY 19, 1916

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 22.
Sec. B. Roads, Room 220. For Program see page 19.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 19.
Sec. B. Bridges, Room 219. For Program see page 22.

AFTERNOON SESSION.

Room 221, Engineering Building.
Mr. G. W. Pickels, Presiding.

1:00 P. M. Standard Highway Construction in Iowa
T. H. MacDonald
State Highway Engineer of Iowa.

2:00 P. M. General Discussion. Safety First in Highway
Traffic: Speed regulations, Hedges, Super-
elevation on curves, Color of paint on bridges,
Vehicle lights, etc.

3:00 P. M. Road and Bridge Construction in Iowa. (Illus-
trated by moving pictures).
T. H. McDonald,
State Highway Engineer of Iowa.

EVENING SESSION.

Room 221, Engineering Building.
Chief Engineer Paul Hansen, Presiding.

7:30 P. M. Concrete Road Construction (Illustrated lecture)
C. M. Powell,
Asst. Engineer Universal Portland Cement Co.
THURSDAY, JANUARY 20, 1916

MORNING SESSION

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 22.
Sec. B. Roads, Room 220. For Program see page 19.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 19.
Sec. B. Bridges, Room 219. For Program see page 22.

AFTERNOON SESSION.
Room 221, Engineering Building.
Mr. W. H. Rayner, Presiding.
1:00 P. M. Importance of Minor Details in Concrete Work.
C. M. Powell, Asst. Engineer Universal Portland Cement Co.
2:00 P. M. Some Things Learned in Building Brick Pavements.
J. W. Stipes, Contractor, Champaign, Illinois.
3:00 P. M. Laboratory Demonstration.
Sec. A, Room 221. Tests of Sand and Gravel.
N. B. Garver, Instructor in Highway Bridges.
Sec. B, Road Laboratory. Rattler Tests of Paving Brick and Tests of Road Stone.
B. L. Bowling, Ass’t in Road Laboratory.
C. C. Wiley, Instructor in Highway Engineering.

EVENING SESSION.
Room 221, Engineering Building.
Prof. C. R. Richards, Presiding.
7:30 P. M. The Manufacture and Properties of Paving Brick.
A. V. Bleininger, Professor of Ceramic Eng’g.
FRIDAY, JANUARY 21, 1916

MORNING SESSION.

8:00 A. M. Sec. A. Bridges, Room 219. For Program see page 22. Sec. B. Roads, Room 220. For Program see page 19.
10:00 A. M. Sec. A. Roads, Room 220. For Program see page 19. Sec. B. Bridges, Room 219. For Program see page 22.

AFTERNOON SESSION.

Room 221, Engineering Building.
Mr. R. E. Davis, Presiding.
1:00 P. M. Machinery for Building Stone Roads.
G. A. Quinlan
Superintendent of Highways, Cook County.
2:00 P. M. Work of the Illinois Highway Commission
A. D. Gash, Chicago President State Highway Commission.
3:00 P. M. The Farmer's View Point of Road Improvement
James P. Wilson, Polo Member State Highway Commission.

EVENING SESSION.

Hotel Beardsley, Champaign.
Prof. F. H. Newell, Presiding.

6:00 P. M. Social in Parlor.
6:30 P. M. Banquet.
7:45 P. M. Financing Road Improvements..........S. E. Bradt
Secretary Illinois Highway Commission.
8:30 P. M. Financing Road Improvements in Williamson County..........................P. B. Wilson Superintendent of Highways, Williamson County.
8:45 P. M. Financing Road Improvements in Cook County.
G. A. Quinlan Superintendent of Highways, Cook County.
9:00 P. M. Roads and Rural Credit................B. F. Harris President First National Bank, Champaign.
OUTLINE OF WORK IN ROADS

In charge of C. C. Wiley, Instructor in Highway Engineering.
Section B at 8:00-9:45 A. M.  Section A at 10:00-11:45 A. M.
Room 220, Engineering Hall.

TUESDAY, JANUARY 11, 1916
SURVEYS, DRAWINGS, AND RECORDS.

1. Surveys required.
2. Methods and instruments.
3. Notes.
4. Plans and profiles.
5. Permanent records.

WEDNESDAY, JANUARY 12, 1916
EARTH ROADS AND SUB-GRADES

1. Soil characteristics.
2. Methods of excavating and transporting earth.
3. Methods of backfilling and compacting.
4. Cross sections.
5. Earthwork computations.
6. Drainage.
7. Costs.

THURSDAY, JANUARY 13, 1916
MAINTENANCE OF EARTH ROADS.

1. What is meant by maintenance?
2. Effects of motor driven and horse drawn traffic.
3. Tractors, graders and other heavy machinery.
4. The light drag.
5. Maintenance of ditches and drainage structures.
FRIDAY, JANUARY 14, 1916

OILED EARTH ROADS.

1. Mixing Method of Construction:
   1. Details of construction.
   2. Adaptability to different soils and climate.
   3. Life and maintenance.
2. Surface Treatment:
   1. Preparation of the road for oiling.
   2. Kind and amount of oil.
   3. Methods and equipment for applying the oil.
   4. Effects of rain, frost and traffic.
   5. Results on different soils.

MONDAY, JANUARY 17, 1916

GRAVEL AND MACADAM ROADS.

1. Materials.
2. Methods and machinery for construction.
3. Comparison of gravel and macadam roads.
4. Effects of traffic.
5. Maintenance methods and costs.

TUESDAY, JANUARY 18, 1916

BITUMINOUS ROADS.

1. Surface treatment of gravel and macadam.
2. Bituminous macadam and bituminous concrete.
3. Sheet asphalt and asphalt block.
4. Patented compounds and processes.
5. Characteristics and adaptability of the different types.
WEDNESDAY, JANUARY 19, 1916

CONCRETE PAVEMENTS.

1. Materials.
2. Proportions and mixing.
3. Distributing, laying, finishing and curing.
4. Expansion and contraction.
5. Reinforcing.
6. Failures.
7. Maintenance.

THURSDAY, JAN. 20, 1916

BRICK PAVEMENTS.

1. Materials.
2. Joint fillers.
3. Sand cushion vs. mortar bed.
5. Maintenance.

FRIDAY, JAN. 21, 1916

ROAD DESIGN.

1. What roads should be improved?
2. Traffic census.
3. Choosing the type of road.
4. Determining widths, grades, etc.
6. Financing the project.
OUTLINE OF WORK IN BRIDGES

In charge of N. B. Garver, Instructor in Highway Bridge Eng’g. Section A at 8:00-9:45 a.m. Section B at 10:00-11:45 a.m. Room 219, Engineering Hall.

TUESDAY, JAN. 11, 1916

SURVEYS FOR BRIDGES.

1. Location.
2. The old bridge.
3. The drainage basin.
4. The foundation materials.
5. Local concrete materials.
7. Recommendations concerning new bridges.
8. Forms for recording survey.

WEDNESDAY, JAN. 12, 1916

AREA OF WATERWAY.

1. Rate of rainfall.
2. Run-off.
3. Methods of determining area of waterway.
4. Effect of future straightening of the channel and of the construction of drainage ditches.

THURSDAY, JAN. 13, 1915

LOCATION OF BRIDGES AND ECONOMICS OF BRIDGE DESIGN.

1. Location.
   a. With regard to stream.
   b. With regard to roadway.
   c. Elevation of roadway.
   d. Skew bridges.
2. Economics of Design.
   a. Foundations.
   b. Substructure.
   c. Superstructure.
   d. Relative costs of substructure and superstructure.
FRIDAY, JAN. 14, 1916

BRIDGE FAILURES AND THEIR CAUSES.

1. Foundations.
2. Steel Superstructures.
3. Concrete Superstructures.
4. Piers and Abutments.

MONDAY, JAN. 17, 1916

INSPECTION OF OLD STEEL BRIDGES.

1. Corrosion.
2. Sizes of members.
3. Kind of material.
5. Details.
7. Supports.

TUESDAY, JAN. 18, 1916

FIELD INSPECTION OF NEW STEEL BRIDGES.

1. Alinement of bridge.
2. Expansion joints.
3. Sizes of members.
4. Arrangement of members on pins.
5. Rivets and bolts.
6. Alinement of truss.
7. Field paint.
WEDNESDAY, JAN. 19, 1916

INSPECTION OF NEW CONCRETE BRIDGES.

1. Inspection and storage of the materials.
2. Proportioning, measuring and mixing.
3. Inspection of forms and falsework.
4. Placing the reinforcement.
5. Placing the concrete.
6. Concreting in hot or cold weather.
7. Bonding new to old work.
8. Removal of forms.
9. Surface finish.
10. Cleaning up.

THURSDAY, JAN. 20, 1916

ESTIMATING THE COST OF A CONCRETE CULVERT.

1. Materials.
2. Labor and hauling.
3. Building falsework and forms.
4. Reinforcing.
5. Excavation.
6. Mixing and placing concrete.
7. Finishing surface.
8. Salvage from forms.
9. Maintaining traffic.

FRIDAY, JAN. 21, 1916

ESTIMATING THE COST OF A STEEL BRIDGE.

1. Materials.
2. Fabrication.
3. Transportation.
4. Erection.
5. Painting.
7. Bidding expenses.
THE UNIVERSITY OF ILLINOIS
THE STATE UNIVERSITY
Urbana

Edmund J. James, Ph.D., LL.D., President

THE UNIVERSITY INCLUDES THE FOLLOWING DEPARTMENTS

THE GRADUATE SCHOOL

THE COLLEGE OF LIBERAL ARTS AND SCIENCES (Ancient and Modern Languages and Literature; History, Economics and Accountancy; Political Science, Sociology; Philosophy, Psychology, Education; Mathematics; Astronomy; Geology; Physics; Chemistry; Botany, Zoology, Entomology; Physiology; Art and Design; Ceramics)

THE COLLEGE OF ENGINEERING (Architecture; Architectural, Civil, Electrical, Mechanical, Mining, Municipal and Sanitary, Railway, and Ceramic Engineering)

THE COLLEGE OF AGRICULTURE (Agronomy; Animal Husbandry; Dairy Husbandry; Horticulture and Landscape Gardening; Veterinary Science; Agricultural Extension; Teachers' Course; Household Science)

THE COLLEGE OF LAW (Three years' course)

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THE COURSE IN JOURNALISM

THE COURSES IN CHEMISTRY AND CHEMICAL ENGINEERING

THE SCHOOL OF RAILWAY ENGINEERING AND ADMINISTRATION

THE SCHOOL OF MUSIC (four years' course)

THE SCHOOL OF LIBRARY SCIENCE (two years' course)

THE COLLEGE OF MEDICINE (in Chicago)

THE COLLEGE OF DENTISTRY (in Chicago)

THE SCHOOL OF PHARMACY (in Chicago; Ph.G. and Ph.C. courses)

THE SUMMER SESSION (eight weeks)

EXPERIMENT STATIONS: U. S. Agricultural Experiment Station; Engineering Experiment Station; State Laboratory of Natural History; State Entomologist Office; Biological Experiment Station on Illinois River; State Water Survey; State Geological Survey; Mine Rescue Station

The library collections contain (October 1, 1915) 322,907 volumes, including the library of the State Laboratory of Natural History (8,338 volumes), the Quine Medical Library (15,472 volumes), and the library of the School of Pharmacy (2,100 volumes), exclusive of maps, sheet music and current periodicals.

For catalogs and information address

THE REGISTRAR
Urbana, Illinois