

## AG-1841 (DC)

### HYDROLOGY

#### Course Objectives:

1. Student will understand the Role of the Water resources in Development of human civilization and sustainability.
2. Student will learn the concept, theory and principle related to Hydrological cycle and application of water for irrigation purpose.
3. Student will learn Data Collection techniques related to various parameter like precipitation, Runoff and losses.
4. Student will learn Analysis of Data, its interpretation and use for forecasting and related problems.

#### Course Contents & Grade

Branch	Subject Title	Subject Code	Credit allotted subject wise		
			L	T	P
B.Tech.- III Sem. AGEngg.	HYDROLOGY	AG-1841	3	1	2

#### **Introduction**

Hydrologic cycle; schematic diagram; Explaining different component so hydrologic cycles.

#### **Meteorological Parameters and Their Measurements.**

Precipitation: Its different forms viz. snow, sleet, rain, hail etc. and their measurement technique; Evaporation, estimation and measurement techniques; Evapotranspiration, estimation and measurement techniques; Wind, measurement techniques for velocity and direction.

#### **Precipitation Data Analysis and Runoff Estimation**

Rainfall mass curve; Hyetograph; Mean rainfall depth; frequency of point rainfall; Plotting position: Estimation of missing data; Test for consistency of rainfall records: Interception; Infiltration: Factors affecting runoff, measurement techniques. rating curves and their extension methods, estimation measurement of streams velocity and discharge.

#### **Hydrograph and Flood Analysis**

Hydrograph separation; Unit hydrograph theory: Unit graph of different duration and Snyder's synthetic unit hydrograph method; Flood routing: Hydrologic reservoir routing by modified Pulse method and Good rich method: Hydrological channel routing by Muskingum routing method: Flood frequency analysis method.

#### **Ground Water Hydrology**

- Occurrence distribution and movement of ground water.
- Hydrological Modeling Introduction of basic concepts, Suggested List of Tutorials
- Study of different types of rain gauges:

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- Rainfall chart analysis. Double mass curve analysis.
- Rainfall averaged depth and probability analysis. Study of stage recorders and current meters.
- Peak runoff rate and runoff volume estimation. Hydrograph analysis.
- Unit hydrograph analysis. Flood routing analysis.

#### Suggested Text Books and References

- Subramanya, K. "Engineering Hydrology". Tata McGraw Hill. Second Edition, 1987. Singh. V.P. "Elementary Hydrology". Prentice Hall of India Pvt. Ltd., Third Reprint, 1994.
- Linsley. R.K., Kohler, M.A. and Paulhus, J.L.H. "Hydrology for Engineers". McGraw Hill International Book Company, Fourth Reprint, 1984.
- Raghunath. H.M. "Hydrology Principles Analysis Design". New Age International (P) Ltd.. Revised Printing, 1996.
- Chow, V.T., Maidment, D.R. and Mays, L.W. "Applied Hydrology". McGraw Hill International Editions. 1988.
- Ghosh. R.K. and Swain, S. "Practical Agricultural Engineering", Vol. I and II, Naya Prakash, Calcutta, 1993.


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AG-1842 (DC)

SOIL MECHANICS

Course Objectives:

To provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil properties. Students will acquire basic knowledge in engineering design of geotechnical systems. To learn the basic concept of types of foundation and bearing capacity, Basic understanding of Earth Pressure concept, slope stability.

Course Contents & Grade

Branch	Subject Title	Subject Code	Credit allotted subject wise		
			L	T	P
B.Tech.-III Sem. AG Engg.	SOIL MECHANICS	AG-1842	3	1	2

**Introduction**

**Engineering Properties of Soils**

Water content; Unit weight of soil; Specific gravity; Void ratio; Porosity; Degree of saturation; Functional relationships; Determination of index properties; Liquid limit; Plastic limit; Shrinkage limit; Plasticity index; Particle size distribution curve.

**Classification of Soils and Clay Mineralogy**

Particle size classification; Textural classification; HRB classifications; Unified soil classifications; and Indian standards classification; Soil structure; Atomic and molecular bond structure of composite soils.

**Soli Hydraulics**

Modes of occurrence of water in soils; Stress condition in soil; Permeability; Factors affecting permeability; Laboratory and field methods of determining permeability coefficients.

Well Hydraulics; Definitions; Dupits theory; Pumping out test; Pumping in test; Interference among wells; Seepage analysis; 2-dimensional flow; Flow nets.

**Elasticity Applied to Soils**

State of stress at a point; Equilibrium equations; Strain components; Stress distribution; Pressure distribution diagrams; Newmark's influence charts; Contact pressure; Principal stresses and maximum shear.

**Compression and Compressibility**

1-dimensional consolidation; Solution of consolidation equation; Laboratory consolidation test; 3-dimensional consolidation test; Vertical sand drain; Compaction; Field compaction methods and controls.

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## Strength and Stability

Shear strength; Mohr circle of stresses; Measurement of shear strength; direct shear tests; Tri-axial compression test; Unconfined compression test; vane shear test; Pore pressure parameters; Active and passive earth pressures; Stability of slopes; Taylor's stability number and stability curves; Retaining walls and their stability conditions.

## Bearing Capacity of Soil and Foundations

Definitions; Rankine analysis; Terzaghi analysis; General and local shear failure;

Mayerhoff's analysis; Effect of water table on bearing capacity; Plate load test; Penetration test; Dutch cone test; types of foundations; settlement of footings; Pile foundations and their classification; Load carrying capacity of piles; Piles in group; Underreamed pile foundations; Different types of well foundation.

## Stabilization of Soil and Site Investigation

Introduction; Method of Stabilization; Site exploration; Depth of exploration; Methods of site exploration; Soil samples and samplers.

## Suggested List of Experiments

- Determination of water content by oven drying methods and pycnometer. Determination of specific gravity of soil by density bottle and pycnometer. Determination of grain size distribution by sieving.
- Determination of liquid limit of soil and plastic limit of soil. Determination of permeability by constant head test and falling head test.
- Calculation of void ratio and coefficient of volume changes by of solids methods. Standard proctor test.
- Determination of shear parameters by direct shear test and triaxial test. Determination of unconfined compression strength of soil

## Suggested Text Books & References

- Murthy, V.N.S. "Soil Mechanics and Foundation Engineering". Delhi, Dhanpat Rai, 1987.
- Punmia, B.C. "Soil Mechanics and Foundation". New Delhi STD Book House, 1987 Gopalrajan and Rao, A.S.R. "Basic and Applied Soil Mechanics", 1993.
- Bowell, S'J. "Soil Mechanics". New Delhi Wiley Eastern, 1991.

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AG-1843 (DC)

I.C.ENGINE

Course Contents & Grade

Branch	Subject Title	Subject Code	Credit allotted subject wise		
			L	T	P
B.Tech.-III Sem. AGEngg.	I.C.ENGINE	AG-1843	2	1	2

**UNIT – I**

Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing.

**UNIT – II**

Combustion in SI engines: Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects of detonation, effect of engine and fuel variables on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., action of dopes, pre-ignition, its causes and remedy, salient features of various type combustion chambers.

**UNIT – III**

Combustion in C.I. Engines: Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, octane number, knock inhibitors, salient features of various types of combustion chambers, Simple problems on fuel injection, various types of engines, their classification and salient features. Rotary I.C. engines, their principles of working.

**UNIT – IV**

I.C. Engine System: Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI & TDI), Theory of carburetion, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine and simple problems, various types of engines, their classification and salient features.

**UNIT – V**

Fuels: Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, unburnt hydro carbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as alternate fuel.

Supercharging: Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.

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### References Books:

1. A course in IC engines by M.L. Mathur & R.P. Sharma
2. Internal Combustion Engines by V. Ganeshan
3. Internal Combustion Engines Theory & Practice by G.F. Taylor
4. Introduction to IC Engines by Richard Stone
5. Internal Combustion Engines by Domkundwar, Dhanpat Rai Publications

### Suggested List of Experiments

1. Load test on ruston oil engine.
2. Measurement of I.P., B.P. and calculation of mechanical efficiency by conducting morse test.
3. Load test on variable compression ratio engine (VCR engine).
4. Performance and analysis of four stroke single cylinder diesel engine test rig with electric dynamometer
5. Performance and analysis of four stroke four cylinder petrol engine test rig with hydraulic dynamometer.
6. Study of carburetter.
7. Study of fuel pump and fuel injector.
8. Study of lubrication system.
9. Study of cooling system.
10. Study of battery ignition system.

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## AG-1844 (DC)

### Applications of AC/DC machines

#### Course Contents & Grade

Branch	Subject Title	Subject Code	Credit allotted subject wise		
			L	T	P
B.Tech.-III Sem. AGEngg.	Applications of AC/DC machines	AG-1844			
			2	1	2

#### Single phase transformer

construction working principle, phasor diagram, types, transformation ratio, parallel operation of two single phase transformer. Use of an auto transformer. Three phase transformer and their applications.

#### D.C. Machines

DC motors and DC generators, constructional features, voltage and torque equations. Speed torque characteristic of DC motors. Methods of speed control. Testing and applications of dc motors.

#### Three phase Induction Motors

Constructional Principles, operation and application. Types of starters, torque slip characteristics application.

#### Single phase Motors

Construction working principle, starting methods and applications.

#### Synchronous Machines

Construction, principle of alternator and motor, V-curves, synchronous condenser and their applications.

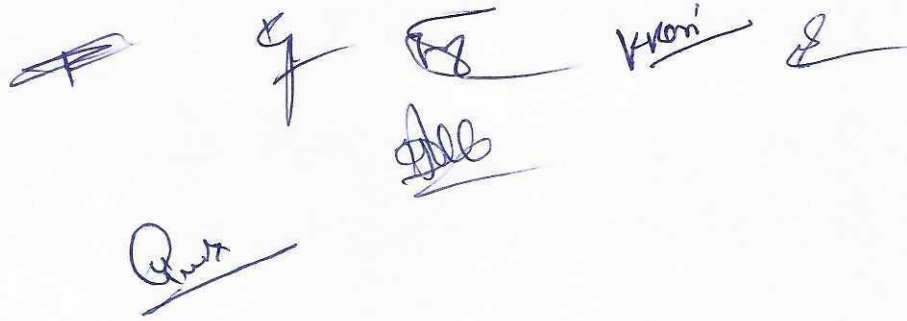
#### Laboratory

- 1) To perform load test on single phase transformer to find efficiency using resistive load and draw efficiency versus load current plot.
- 2) To perform parallel operation of two single phase transformer by conducting polarity test.
- 3) Demonstration of various configuration of three phase transformer.
- 4) Speed control of DC shunt motor by field weakening and armature rheostatic control method
- 5) Load test on DC shunt generator and to draw its performance characteristics (external/drooping)
- 6) To perform no load test on DC Machine (Swinburne's test) to find its efficiency at any load
- 7) Demonstration of starters to start a three phase induction motor .
- 8) Demonstration of starting method used for starting of single phase induction motor.
- 9) Demonstration of DC starter to start DC motor .
- 10) To plot the V-curves of a synchronous motor at no load. (CO2)

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### Suggested Text Books & References

- Dr. P.S. Bimbhra, "Generalized Theory of Electrical Machines" Khanna Publishers.
- Dr. P.S. Bimbhra, "Electrical Machines" Khanna Publishers.
- J.B. Gupta, "Electrical Machines" S.K. Kothari & Sons.
- Electrical Machines Nagrath & Kothari
- R K Rajput "Electrical Machine " - Laxmi Publication.
- GMC pherson and R.D.Larmorl, "An Introduction to Electric Machine & Transformer" (2<sup>nd</sup> Ed.) John Wiley & Sons, 1990

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AG-1845 (DC)

CROP PRODUCTION

Course Contents & Grade

Branch	Subject Title	Subject Code	Credit allotted subject wise		
B.Tech.-III Sem. AGEngg.	CROP PRODUCTION	AG-1845	3	1	2

**Introduction**

Concepts in crop production; geographical distribution of crops and cropping systems; economic importance.

**Crop Classification**

Cereals, pulses, oilseeds, fiber crops, forage crops, medicinal and aromatic crops and horticultural crops.

**Cropping Systems for Major Agro-Ecological Regions**

Detailed descriptions of rice based cropping systems, sugarcane based cropping systems, cotton based croppings stems, pulses and oilseeds based cropping systems, their suit ability in different agro-ecological regions.

**Crop Eco Systems**

Irrigated and rain fed eco systems, strategies of crop production in tropical and sub-tropical regions in the two major Eco systems under different crops.

**Modern Techniques of Raising Field and Horticultural Crops**

Techniques of nursery raising, method of planting, fertilization, irrigation scheduling, weed control, and other practices to optimize yield, economic evaluations.

**Tillage Practices and Soil Management**

Conventional tillage practices their effects and shortcomings, modern tillage practices and their advantages; optimum tillage with different tillage implement sand their effect on soil properties, soil changes due to long term effect of certain tillage system.

**Seed and Seeding Practices**

Quality of seed, seed rate, seed treatment, seeding methods, modern seeding techniques.

**Scheduling of Irrigation and Fertilizers**

Irrigation schedules for different crops in different soils and agro-climatic regions, ferti-irrigations, irrigation methods.

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## **Plant Protection Measures**

Pesticides types of weedicides and insecticides available to control different weed flora, pests and diseases and their mode of action; time of application and symptoms,

## **Harvest and Post Harvest Operations**

Method of harvesting; modern implements their efficiency and economics, losses during harvesting and threshing and storage; threshing method and modern threshing techniques, and economics.

## **Dry Farming Principles and Practices**

Water stress in relation to crop productivity; concept to crop productivity and plant type for dry farming areas; dry farming practices; crop improvement for efficient water use and efficient water utilization practices.

## **Crop Growth Assessment and Modeling**

Crop, growth parameters and their measurements, models for estimating crop growth and yield and their usefulness.

## **Suggested List of Experiments**

- Identification and acquaintance with seeds, plants, weeds and agro-chemicals. Testing of germination, viability and vigour of seeds.
- Estimation of agrochemicals for field applications. Determination of tillage requirement for field preparations. Hydroponics.
- Seeding and planting techniques and assessment of standard establishment of field crops.
- Irrigation water measurement techniques.
- Biometric observation on growth, yield and yield attributes. Measurement of leaf area index.
- Determination of chlorophyll content in leaf. Estimation of oil in different oilseed crops. Determination of N : P : K in crops.

## **Suggested Text Books and References.**

- Singh, Chidha "Modern technique of raising of field crops". Oxford and IBH Publishing Company Pvt.Ltd., 1994.
- Agarwal R.L."Seed Technology". Oxford and IBH Publishing Company Pvt. Ltd., 1990.
- Chalam, G.B., Singh Amir and Douglas. J.E. "Seed Testing Manual". ICAR and NSC, 1967.
- Rao, V. S. "Principles of Weed Science". Oxford and IBH Publishing Company Pvt. Ltd., 1983.
- Singh, R.P., Reddy, P.S. and Kiresur, V.(eds.). "Efficient Management of Dry and Crops in India". Indian Society of Oilseed Research, DOR Rajendra Nagar, Hyderabad, 1997.
- Prihar and Sandhu. "Irrigation of Field Crops - Principles and Practices". ICAR, 19.

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