

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN CIVIL ENGINEERING

Semester: 4

Subject Name: Irrigation Engineering

| Sr. No. | Course content |
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| 1 | INTORDUCTION: 1.1 Necessity of Irrigation, Merits and demerits. 1.2 Mode of irrigation, Minor and Major projects, Components of above projects. 1.3 Major project in India and Gujarat. 1.4 Capacity of reserving various heights (levels), capacity and size of main canal, location., 1.5 Relationship between Bhakranangal,Ukai-Kakrapar Kadana- Vanakbori,Dharoi-Vasna barrage 1.6 Classification and suitability of irrigation methods, Drip and Sprinkler irrigation |
| 2 | WATER REQUIREMENT OF CROPS 2.1 Suitability of soil for crops., Methods of improving soil-fertility 2.2 Water holding capacity of soil 2.3 Quality of irrigation water, Soil moisture., Hygroscopic, Capillary Gravitational moisture, Importance of above moisture and available moisture, Function of moisture(water) in growth of plant. 2.4 Terms related to irrigation: Duty, Delta, Base period, crop period. Kor period, core depth, demand. gross command area, culturable command area, intensity of irrigation, time factor, overlap allowance. 2.5 Values of Duty, Base period, crop period for major crops grown in Gujarat. 2.6 Relation between Duty, delta and base period: establishment of relation and apply the relation to solve the problems. 2.7 Seasons related to irrigation and major crop grown in each season. 2.8 Computation of capacity of canal and reservoir from given data. 2.9 Methods of reckoning duty , Factors effecting Duty. place at which duty is measured. consumptive use of water, Irrigation water charges |
| 3 | HYDROLOGY. 3.1 Precipitation., Intensity, average, mean annual rainfall. Method of determining them. Theision's polygon, Isohytel, Arithmatical average method. 3.2 Run-off, Definition - Factors affecting runoff, computation of runoff 3.3 Peak flood. Concept, Computation. formula, frequency studies* hydrograph and unit hydrograph and applications, their sketches, assumption and applications * Empirical formula and their limitations. 3.4Infiltration, Concept and importance |

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| 4 | <p>GROUND WATER</p> <p>4.1 Sources of water, Importance of underground water in Gujarat., Terms related to groundwater engineering.</p> <ul style="list-style-type: none"> - Aquifer, Aquiclude, Aquifuge, Aquifer porosity Specific yield , - Specific retention, storage coefficient, coefficient of permeability, coefficient of transmissibility, Yield, specific yield. <p>4.2 Types of well, Open, (watertable) Tube and flowing well. concept, location and importance.</p> <p>4.3 Construction methods of above well (steps only),Recuperation tests- pumping and recuperation.</p> <p>4.4 Recharging of wells., Importance and methods of recharging.</p> |
| 5 | <p>RESERVOIR PLANNING</p> <p>5.1 Survey and investigations., Investigations for hydrologic data, Demand of water, rainfall, crop pattern.</p> <p>5.2 Stream flow, flood flow, losses, sedimentation, water quality, tail water curves..</p> <p>5.3 Geological data. ,Reservoir site, dam site, construction materials, water tightness, suitability of foundation, ground water condition, location of quarry site etc.Topographic investigations., catchment at dam site, survey of borrow area. Collection of legal data, water right.Investigation of reservoir site, land acquisition cost, site clearing , rehabilitation, area elevation, storage elevation.Environmental considerations, - fish and wild life recreation, historical places, archeological factors. (monuments etc.), Economical data - Benefit cost ratio.</p> <p>5.4 Selection of site for reservoir on the bases of above 5.1.</p> <ul style="list-style-type: none"> - Methods of estimating reservoir capacity Trapezoidal, cone, prismoidal formula <p>5.5 Zones of storage., Dead, live & flood storages.</p> <p>5.6 Reservoir losses, Evaporation, seepage and others.</p> <p>5.7 Reservoir sedimentation and its control concept- method of controlling, like afforestation, checkdams, contour bunding, soil stabilisation on of C.A. and other methods</p> |
| 6 | <p>DAMS</p> <p>6.1 Classification of dams. Gravity dams - Masonry, concrete. Earthen dams- Rock filled and other types. Arch dams.- Composite dams. High & low dam. Overflow & non-overflow dam.</p> <p>6.2 Factors for selecting type of dam, List, Influence of each factor, selection from given factors.</p> <p>6.3 Gravity dam, Characteristics of gravity dam. Component; forces, joints, keys and water thightness of joint.</p> <p>6.4 Concept of low and high dam,* theoretical & practical profile., Conditions of stability of gravity dam, reduction of uplift by sheet pile and drainage galleries.</p> <p>6.5 Constructing gravity dam.</p> <p>6.6. *Stages: -diversion of stream and dewatering.,-foundation treatment with all of</p> |

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| | <p>stages & curing - concepting with all stages & curing of masonry work – provision of galleries & openings. Joints & water tightness of joints. equipment used (list and purpose only)</p> <p>6.7 Earthen dams., Components , *List of dams. *functions. -Materials used for various components., Typical section of earthen dam for various situations.(sketches only),Criteria for safe design, Seepage of water in earthen dam & phreatic line.,-seepage from foundation -methods of reduction of seepage, uses of fillters & rock toe.</p> <p>6.8 Construction of earthen dam,-Operations and stages.,-Equipment used (list and purpose)</p> <p>6.9 Spillways, Types, line diagram, merits & demerits, situations where the are suitably used. Types of gates, hoisting of gates., Statement, explanation and limitations.</p> |
| 7 | <p>DIVERSION HEAD WORKS.</p> <p>7.1 Purpose., Component parts & sketches., Barrage- Situation., Weir- Situation</p> <p>7.2 Comparison of weir and barrage. Sketch the component parts.</p> <p>7.3 Bligh's creep theory.,</p> <p>7.4 Khosla's theory- Statement, explanations and limitations, Safe exit gradient, Causes of failure of weir and remedial measures.</p> <p>7.5 Control of silt entry, Scouring sluices, silt excluder, silt ejector, head regulator</p> |
| 8 | <p>CANALS</p> <p>8.1 Classifications, Ridge and contour, features of both, Functions of each according to network., Line diagram of network of canal.</p> <p>8.2 Canal Alignment., Factors influencing canal alignment .,Cross-section of canal, cutting, partly cutting & filling, embankment., Parts of each component with their functions.</p> <p>8.3 Silt theory., Kennedy's & Lacey's. Concept & applications, Silting & scouring, Regime & semi, regime conditions.</p> <p>8.4 Design of canal, Canal capacity, dimensions, Lacey's regime chart., Garret chart (no examples)</p> <p>8.5 Canal lining. Its advantages., Types of canal lining materials, Methods of canal lining.</p> <p>8.6 Regulation works., Head regulator, cross regulator, falls & escapes. -Situations, purpose, sketches.</p> <p>8.7 C.D. Works.,-Types , functions & sketches, Outlets. - types, situation, functions & sketches</p> <p>8.8 Water-logging, effects, causes & prevention</p> |
| 9 | <p>WATER RESOURCE PROJECT PLANNING & FLOOD CONTROL</p> <p>9.1 Project, types, benefits etc.</p> <p>9.2 Flood control, Design, High and normal flood, Methods of flood control</p> |

Reference Books:

| Sr. No. | Name of Books | Author |
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| 1. | Power Engineering & Water Resource Engineering | B.C.Punamia |
| 2. | Irrigation, Water Resource Engineering & Power Engineering | Dr. P.N.Modi |
| 3. | Ground Water | H.M.Ragunath |
| 4. | Irrigation Engineering | G.L.Asawa |
| 5. | Water Resource Engineering | S.K.Garg |
| 6. | Irrigation Engineering | A.M.Michale |