

South Gujarat University, Surat.

Teaching and Examination scheme for

M.E (Civil) In Water Engineering

First Semester

Course NO	Course Title	Hours per week			Examination Scheme	
		T	P/D	Cr.	T	P/Viva
Ma 901	Statistical and Mathematical Modeling	3	0	6	100	--
CE 904	Applied Hydraulics	3	0	6	100	--
CE 931	Irrigation Engineering	2	2	8	100	50
CE 932	Water Resources System	3	0	6	100	---
CE 933	Advanced Fluid Mechanics	3	2	8	100	50
Second Semester						
CE 934	Advanced Hydraulic	3	2	8	100	50
CE 935	Remote Sensing Techniques and Applications	2	2	8	100	50
CE 936	Ground water Management	3	0	6	100	--
CE 937	Transient Flows and Water Power Engineering	3	0	6	100	--
Electives (Any One)						
CE 938	Port, Harbour and offshore Structures	3	0	6	100	--
CE 913	Computer Programming and its Application to Civil Engineering	3	0	6	100	--

Course No.	Course Title	Hours per Week			Examination Scheme	
		T	P/D	Cr.	T	P
CE 915	Energy and Environment	3	0	6	100	-
CE 939	Drainage and Salinity	3	0	6	100	-
CE 940	Applied Hydrology	3	0	6	100	-
THIRD SEMESTER						
CE 941	Seminar	-	-	6	-	50
CE 942	Dissertation	-	-	36	-	250

NOTE :

1. Practical, Termwork and Seminar will be assessed departmentally. The marks, however will be recorded in the University marksheet.
2. The subject of the dissertation shall be assigned to the student in the Second Semester. The Assessment of the dissertation will be carried out in three stages, at; the beginning of the third semester for 50 marks during the third semester for 50 marks and the final viva-voice examination for 150 marks. The first two assessments will be departmental and for final assessment, there will be university examination.
3. The departmental assessment will be the assessment by a panel of three teachers, including the subject teacher of the guide as the case may be professor in charge of the centre and the third teacher nominated by the professor – in charge of the Centre.
4. course no.Ma 901, CE 904, CE 913 and CE 915 are common for the specialization in the Environment Engineering.

Details of courses for ME (Civil) In Water Engineering

CE 931 Irrigation engineering and watershed management

A: Irrigation project management

1. Introduction: Timing, sequence and strategy for the planning and realization of the irrigation projects. Management, operation and maintenance of irrigation projects.
2. Climatologically, topographic, pedologic and water resources survey, agronomic considerations and socio-economic incentives.
3. Realization of irrigation project : Land preparation, and methods irrigation. Level borders, graded borders , sprinkling irrigation system, drip irrigation system. Canal outlet structures and farm turn-out structure.
4. Water resources analysis: Utility function, cost benefit analysis, water resources management policies.

B: Watershed management

1. Introduction, objectives of hydrologic analysis, hydrologic cycle and response of catchment area, types and characteristics of reservoir, related hydrologic data, hydrograph analysis.
2. Statistical methods and computer models in surface hydrology: Probability, plotting and frequency analysis linear regression and correlation. Analysis of hydrologic time series, hydrologic models.
3. Reservoir operation, inflow – Outflow calculation, reservoir losses, and reservoir working table leading decision of optimum height of dam. Storage capacity and life of reservoirs.
4. Flood routing: Reservoir routing and stream flow routing problems. Laboratory / Design courses based on the theory course prescribed above.

References:

1. Houk E. Ivan, "Irrigation Engineering, Vol. I, John Wiley.
2. Linsley and Franzini, 'Water Resources Engineering', McGraw-Hill

3. Arthur Mass and others, Design of “water Resources System” , Macmilan.
4. Ven Te Chow, “Hand Book of Applied Hydrology”, McGraw – Hill

CE: 932 Water Resources System

Objectives of water resources development, Economic Analysis and Discounting Techniques. Conditions of Project Optimality Graphic optimization techniques for water resources project by linear programming, non- linear programming, and dynamic programming. Optimization by simulation, mathematical models for large scale multipurpose projects. Different case studies, stochastic optimization techniques. Water quality subsystems, optimum operation model for reservoir systems by incremental dynamic programming. Sequence of multipurpose project.

Text/ Reference

1. Arthur mass and others; “ Design of Water Resources Systems”, Macmillan
2. L.D. James and R.R. Lae, “Economic of Water Resources Planning” MacGraws Hill
3. W.A Hall and J.A Dracup, “Water Resurces Systems”, MacGraw –Hill.

CE : 933 Advanced Fluid Mechanics

1. One dimensional method of analysis, momentum and energy correction factor.
2. Fundamental laws of motion for viscous fluid: The boundary layer concept, separation and vortex formation, turbulent flow in a pipe and in a boundary layer, Navier-stokes equations and their general properties, exact solution of Navier – stokes equations for two dimensional flow and their properties, boundary layer on a plate, Hele- shaw model.
3. Laminar boundary layers: boundary layer equations for two dimensional flow and their properties, boundary layer on a plate, exact solution of the steady state boundary layer equations in two dimensional flow, approximate methods for the solution of two dimensional flow, steady boundary layer equation, boundary layer control in laminar flow.

4. Turbulent boundary layer: Transition from laminar to turbulent flow, origin of turbulence, fundamentals of turbulent flow, theoretical assumptions for the calculation of the turbulent flow, turbulent flow through pipes, turbulent boundary layer at zero pressure gradient on a flat plate, pressure gradient flows, free turbulence flow.
5. Open channel flow: concepts of specific energy, conveyance of the section, critical depth, mild, steep, critical and adverse slopes, non-uniform flow in open channel, hydraulic jump, gradually varied flow, different type of backwater and drawdown curves, differential equation for varied flow, graphical integration, direct integration and step method.
6. Circulation, Magnus effect, flow past a wing, lift and drag, angle of attack.
7. Small amplitude wave theory: fundamentals of idealized fluid flow, Laplace equations, formation and solution of boundary value problems, wave celerity, classification of water waves according to relative depth, orbital motions and pressures, superposition, wave trains and wave energy, transformation of waves, dissipation of wave energy.
8. Unsteady flow: Elementary water hammer analysis and surges.

Text/ Reference

1. J.W. Daily and D R F Harlaman, Fluid Dynamics, Addison Wesley
2. S V L Streeter, Fluid Dynamics, McGraw Hill
3. S.Narsimhan, Engineering Fluid Mechanics VOL. I Orient Longma

CE: 934 Advanced Hydraulic Structures

1. Design, Construction and maintenance of concrete gravity dams, earth and rock fill dams, arch and buttresses dams.
2. Design and maximum probable floods, calculation and prediction, flood disposal works, spillways, gates and buckets. Energy dissipation works, stilling basins and deflector blocks.
3. Design of weirs and barrage on permeable foundations. Khosla's theory, flow net analysis and seepage calculations.
4. Lined and unlined canals: Design, Construction and maintenance.

5. Cross – drainage and canal regulation works.
6. Flood control and river training works.

Laboratory courses based on the theory prescribed above.

Text/ Reference

1. Davis, Handbook of Applied Hydraulics, MacGraw – Hill.
2. Creagor, Justin and Hinds, ‘ Engineering for Dams’, Vol I, II, and III John Wiley.
3. Bharat Singh, ‘ Text Book on Irrigation Engg.’ Nemchand , Roorkee.

CE: 935 Remote Sensing Techniques and Applications

Fundamental principles of Remote sensing , definition, scope, stages – photo reading, photo analysis, photointerpretation techniques-deduction, induction, convergence of evidence. Factors affecting interpretability. Physical , mechanical, psychological factors. Qualification for a good photointerpreter.

Image characteristics: Meaning, importance and aids, recognition elements, shape, size, scale, pattern, shadow, tones, texture, drainage, vegetation, site association.

Imaging Bands: Visible, near I R thermal microwave characteristics and advantages.

Keys: Definition, classification, merits and demerits.

Photo Interpretation Cell: Organization, equipments, costs.

Engineering Applications: versatility, hydrology, irrigation, hydrograph, oceanography, highways, railways, transmission lines, pipelines, canals, urban and regional planning and urban morphological studies, earth quake studies, water pollution detection.

Nature Resources Inventories: Significance in the country’s growth and developments. Forestry, Wildlife, agriculture, range, minerals, oil, water, contraction materials.

Earth Science Studies: Geology, Geomorphology, Glacial, fluvial and Aeolian deposits, geographical studies, soil typing and mapping, archaeological discoveries.

Other Application: Field equipment, maps by photo interpretation, field verification, finalization of photo interpreted maps.

Text/ Reference

1. Eric C Barret and Leonard F Curtis “Environmental remote sensing applications and Achievements, Edward Arnold.
2. Manual of Photographic Interpretation, American Society of Photogrammetry, 1st Edition 1960 by R N Coiwell(Editors).
3. Leslie W Senger, “Remote Sensing Techniques for Enviromental” Analysis, Hsmilton.

CE: 936 Groundwater Management

Occurrence of ground water. Type of aquifers, groundwater in different formations and its movements. Mechanics of well flow, exact solution for flow to fully and partially penetrating wells in confined aquifers. Leaky aquifers, unconfined flow to wells, approximate solutions, aquifer tests, well design criteria, ground water control.

Techniques of artificial recharge. Solution to transient problems of ground water mounts. Theory of subsurface drainage, Stream – aquifer system, Ground water quality, Seawater intrusion into coastal aquifers. Approximate solutions. Multiwell well systems, hydro geologic system analysis, digital and analog models for evaluation of aquifer response. Groundwater development and management.

Text/ Reference

1. Roger Deweist, “ Geohydrology”
2. W C Walton “ Groundwater Resources Evaluations”
3. D K Todd , “Groundwater Hydrology”, Wiley International.

CE 937: Transient Flows and Water Power Engg.:

1. Fluid transient flow concept: Causes of transients, basic transient flow equations methods of analysis, scope and range of problems in fluid transient.
2. Methods for Controlling Transients: Wave speed reduction methods, air chamber and accumulator, Surge tanks, flow control method and valving.

3. Water Power: Sources of energy, status of power in the world, hydropower and its place in a power system, estimation of water power potential.
4. Types of Hydro-power Plants: Classification of hydel plants, run-river plants, valley dam plants, diversion canal plants, high head diversion plants, storage and poundage.
5. Water Conveyance: Penstocks and accessories, water hammer and surges, intake canals and tunnels.
6. Power House Planning: Surface and underground power stations, types of layout and design.

Text/ Reference

1. Wylie and Streeter, “Fluid Transients”, Mac Graw Hill
2. M. M. Dandekar and K. N. Sharma, “Water Power Engineering”
3. Vikas Publishing House, New Delhi, Dr. K. L. Rao, “water wealth of India”.

CE 940: Applied Hydrology

1. Introduction: Development in hydrology and its rate in water resources project, hydrologic cycle.
2. Precipitation: Types and forms of Precipitation, Water losses; evaporation, interception, evapotranspiration etc. Run-off, hydrometric network and optimum network.
3. Infiltration: Infiltration rate, Infiltration indices, factors affecting infiltration, methods of determination infiltrometers.
4. Rainfall: Rain gauging instruments and their installation, methods of computing average, rainfall, mean annual rainfall and its determination, time series distribution, depth-duration curves, depth-area-duration curves.
5. Run-off: Factors affecting run-off, estimation, run-off coefficient, empirical formulas, infiltration method.

6. Hydrograph Analysis: Unit hydrograph and derivation, instantaneous hydrograph, synthetic unit hydrograph.
7. Flood Flow: Flood estimation by hydrograph, other methods of flood estimation, flood frequency, probable maximum flood, mass curve.
8. Stream Gauging: stage discharge curves, discharge measurements, methods of discharge estimation.
9. Reservoir Planning : Flood absorption capacity, design capacity, evaporation losses, reservoir routing of floods.

Text/References

1. Ven Te Chow, “ Hand Book of Applied Hydrology” MacGraw – Hill.
2. V. Yevjevich, “Stochastic Process in Hydrology & Water Resources, Fort Collins, Colorado.

CE 904: Applied Hydraulics

Analysis of pipe flow, minor and major losses in the pipe system.t Concepts of equivalent pipe length, multiple pipe system, distribution mains, working pressures, design pressure and test pressure, choice of pipe material, Classification of pressure pipes and their diameters. Hydraulic analysis of pipe networks, water hammer, regulations for closure and opening of valves, surge tanks.

Application of channel flow in wastewater carriage system, flow measurements, diffusion and design process of effluent, disposal system.

Application of turbulent flow in water and air quality management system.

Ground water and well hydraulics, design of single and multiple well system, testing of well, sanitary protection of wells, collector wells, French wells, quality of ground water.

Artificial recharge of ground water and control of sea water intrusion in the coastal aquifers.

References:

1. V L Streeter, “ Fluid Mechanics ”, MacGraw – Hill Book CO.
2. David K Todd, “ Ground Water Hydrology”, Wiley International Edition.

CE 913: Computer Programming and its Application to Civil Engineering

Functional organization of computer systems, fixed and floating point data.

Introduction of machine language, algorithms and flow charts, counting and looping, introduction to FORTRAN language.

Selected samples illustrating the program development process and use of control structures and I/O formats.

Selected Examples of the applications in the Environmental Engineering, Water Engineering, Transportation Engineering.

References:

1. V Rajaraman , “ Computer Programming in FORTRAN-77” Prentice Hall of India.
2. B W Keruighan and P J Planger, “ The Elements of Programming Style”, MacGraw Hill Book Co.

Ma 901: Statistical and Mathematical Techniques

Statistics as applied to turbulent flow analysis and hydrologic classification and tabulation of data, frequency distribution, Measures of central tendency and spread, elements of probability idea of estimating and testing of hypothesis, large sample size, correlation and linear regression.

Elements of matrix calculus, numerical methods introduction to linear programming, Simplex computational procedure, Transportation problems, network algorithms.

Introduction to queuing theory, probability distributions of inter arrival times and service times.

CE 943: Management and Economics of Irrigated lands

Introduction, Organization and administration of water distribution system, Financing for construction and operation, maintenance of canals, flumes, pipelines, dams, regulating reservoirs and other facilities, water requirement and management of uses level. Case studies or examples of various river basins and other water management systems.

Macro economic planning, principles of project analysis, criteria, for choosing among alternatives, Benefit-cost ratio, shadow pricing, externalities, discount rate.

References:

1. Related documents of water policies and administration of Gujarat state.
2. Economic analysis of agricultural projects- Gittinger
3. Cost- Benefit analysis – A hand book. – P G Sasson and W.A Schaffer

CE 944 : Agronomy and Soils:

Soil formation, physical & chemical properties, soil solution, ion exchange, colloidal behavior, ionic equilibrium and transport, salinity.

The soil, Chemical and environmental factors that affect the mineral nutrition of the plants, nutrient availability, absorption, toxicity, fertilizer management.

Fertilizers: Simple and compound fertilizers involving nitrogen, phosphorous, potassium, Secondary and minor elements.

Plant water relationship, mechanics of water stress and its effect on field.

Soil microbiology activities and ecology of microorganisms related to soil properties, soil fertility, soil organic matter and the rhizosphere .

References:

1. Modern irrigated soils – D W James, R H Hanks and J J Jurinak : John- willy & sons.
2. Soil fertility & Fertilizers- Sanmel L Tisdale, Werner L Nelson: McMillan Publ. Co.
3. Soil Chemistry – H.L Bohn, O.L Mcnell, G.A.O. Connor : John-Willey & sons.
4. Methods of Soil analysis(Agronomy 9) – part I & part II.: Edited by C A Black, American Society of Agronomy.

CE 945: Environment and Ecological Issues:

Introduction, Population, resources, environment, interactions among resources, economics and politics, interaction among technology environment and well- being.

Population and ecosystem, Natural selection & evolution, community ecology, ecological models, land water & forests.

Disruption of Ecological System, modifying ecosystems, atmosphere & Climate, thermo nuclear warfare, Ecological accounting.

Reference:

1. Ecosicences – P R Ehrlich, A H Ehrlich & J P Holdren
2. Water in Environmental Planning- T. Dunne & L B Leopold: W H Freeman & Co., San Francisco.
3. Ecology 2000- Sir Edmand Hillary, Michael Joseph: London, 1984.
4. Dynamic Environment – Edwin H. Marston : Xerox College Publishing, Toronto.