



**BHARATI VIDYAPEETH UNIVERSITY,
Pune.**

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COURSE STRUCTURE & SYLLABUS
M. Tech. (Civil) (Semester - I to IV)



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

M. Tech. (CIVIL) (Sem. I to IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from undergraduate to doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MOUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

The Construction activity is the second largest economic activity in India next only to agriculture. The amount of money invested and the jobs provided by the Civil Engineering industry are much larger than any other industry. Overall globalization of the economy has resulted in more and more demand for better infrastructure facilities like roads, bridges, airports and project related to water resources. The Civil Engineer therefore has to play a major role in the development of the country. The Department of Civil Engineering desires its students to excel in the changing trends in global economy.

The department of Civil Engineering has developed two fold:

- It has well-established laboratories in subjects of Structural Engineering, Environmental, Hydraulics, Geotechnical, Transportation, Geology, Surveying and Computer Engineering. The department also maintains a well-equipped audio - visual room with facilities like VCR, TV, and overhead and slide projector for projecting videocassettes, CDs, slides and transparencies containing technical demonstrations. There are more than 200 videocassettes and CDs, 35 wall charts demonstrating various Civil Engineering theories and techniques.
- The department has developed linkages with C. W. P. R. S. Pune and INSWAREB Vishakhapattanan for research works in Hydraulics and concrete materials. The department also has access to laboratories of CW & PRS and libraries of IAT, Pune and I. I. T. Powai, Mumbai. The department maintains a separate departmental library consisting of some rare books.

The teaching staff of the department is actively involved in research works. The research works on protection of scour around bridge piers by riprap, use of mineral admixtures in concrete are some of the research work successfully done. The faculties of the department routinely publish their works in reputed journals and conferences at national and international level. The testing and consultancy cell of the department caters to the various technical services in Hydraulics, Soil Mechanics, Bridge and Dam foundations, Environmental Engineering, Concrete Materials and Surveying.

The department also runs a postgraduate course in Hydraulic Engineering. This course is blessed by the guidance of some of the internationally recognized scientists in the field of Hydraulics. The P.G. Students perform their dissertation works in collaboration with CW & PRS laboratories, especially the model studies. The undergraduate and postgraduate students have unlimited access to the Internet facility provided by the department. The Civil Engineering Students Association (CESA) serves as a platform for the overall development of the students. The CESA organizes personality development programs, guest lectures of experts; site visits to Civil Engineering projects and is also actively involved in social programs. The department has also organized national level workshop

on artificial neural network, Hydraulic structures and advances in concrete technology in the last few years.

MAJOR GROUPS/AREAS

Hydraulic Engineering, Structural Engineering, Computer Aided Analysis and Design, Concrete Technology, Environmental Engineering, Foundation Engineering, Surveying, Project feasibility, Engineering Geology.

EXPERTISE IN RESEARCH AND CONSULTANCY

Pump Testing, Precision Survey works, Analysis and Design of Structures, Testing of Concrete, Building Materials and Metals, Concrete Composites, Air & Noise pollution, Water quality, Geological Investigation for Civil Engineering Structures.

MAJOR EQUIPMENTS

Universal Testing Machine (1000KN & 200KN) with computer attachment, Compression Testing Machine (2000KN), Concrete Mixer, Torsion Testing Machine, Polariscopes, Wind Tunnel, Tilting Flume, Airflow Bench, Standard Penetration Tests set up, Electronic Distance Meter, High Volume Sampler with PMIO, Spectrophotometer, Nephelometer, Turbidity meter, Flame Photometer, Noise Level Meter.

SOFTWARE

AutoCAD 2000, STAAD-PRO, Geo-Concept GIS, MATLAB, Hit-Office

LABORATORIES

Testing of Materials, Engineering Mechanics, Geotechnical & Transportation Engineering, Environmental Engineering, Fluid Mechanics & Hydraulic Machinery, Survey Laboratory, Geology Laboratory



STRUCTURE & EXAMINATION PATTERN

M. Tech. - Civil Engineering

Semester I								Total Duration : 34 Hrs/Week	
								Total Marks : 700	
Subject Code	Subject	Teaching Scheme Hrs/Week		Examination Scheme				Total	
		L	P	Theory	Unit Test	T.W.	Or.		
K20501	Advanced Fluid Mechanics	04	02	70	30	25	25	150	
K20502	Water Resources Engineering	04	02	70	30	25	25	150	
K20503	Computational Methods in Hydraulic Engineering	04	-	70	30	-	-	100	
K20504	Hydrology	04	-	70	30	-	-	100	
Total		16	04	280	120	50	50	500	

Teaching Scheme		Examination Scheme (Marks)				Total
Lectures	Practical	Theory	Unit Test	T. W.	Or.	
16	04	280	120	50	50	500

Semester II								Total Duration : 34 Hrs/Week	
								Total Marks : 800	
Subject Code	Subject	Teaching Scheme Hrs/Week		Examination Scheme				Total	
		L	P	Theory	Unit Test	TW	Or		
K20505	Sediment Transport & River Engineering	04	02	70	30	25	25	150	
K20506	Water Impounding Structures	04	-	70	30	-	-	100	
K20507	Open Channel Flow	04	-	70	30	-	-	100	
K20508	Optimization in Hydraulics	04	02	70	30	25	25	150	
Total		16	04	280	120	50	50	500	

Teaching Scheme		Examination Scheme (Marks)				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr	T. W. & Or.	
16	04	280	120	50	50	500



STRUCTURE & EXAMINATION PATTERN

M. Tech. - CIVIL

Semester III								
Subject Code	Subject	Teaching Scheme (Hrs.)		Examination Scheme (Marks)				Total (Marks)
		L	P	Theory	Unit Test	TW	Oral	
K20601	Elective I	04	02	70	30	25	25	150
K20602	Elective II	04	02	70	30	25	25	150
K20603	Seminar	-	01	-	-	25	25	50
K20604	Dissertation stage I	-	02	-	-	25	-	25
	Total	08	07	140	60	100	75	375
		15		200		175		375

Semester IV								
Subject Code	Subject	Teaching Scheme (Hrs.)		Examination Scheme (Marks)				Total (Marks)
		L	P	Theory	Unit Test	TW	TW & Or	
K40513	Dissertation Stage II	-	04	-	-	150	75	225
	Total	-	04	-	-	150	75	225
		04		-		225		225

Grand Total - 1600

Elective - I

- Hydraulic Modelling and Hydro Power Structures
- Coastal Engineering

Elective II

- Numerical Methods in Hydraulic Engineering
- Environmental Fluid Mechanics

Dissertation Stage I:

- Identification of Problems
- Preparation of Synopsis
- Literature Survey and Formulation of Problem

Dissertation Stage II:

- Experimentation
- Data analysis
- Submission of final report



RULES FOR CONDUCTING TESTS

Mode of the test

- Three unit tests per subject shall be conducted in each semester. The schedule for the same will be declared in the academic calendar of each term.
- Each unit test shall carry 30 marks.
- University examination pattern has given weightage of 30 marks for unit tests and 70 marks for theory examination
- To calculate final marks of the unit test following procedure is followed:
 - i) Out of the three unit tests conducted during the semester, the marks of only two unit tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject
 - ii) Average marks obtained in two unit tests in which students have performed well shall be considered as provisional marks obtained by the student.
 - iii) If the candidate appears only for two unit tests conducted during the semester, he/she will not be given the benefit of the best performance in the tests.
 - iv) If the candidate appears only for one unit test conducted during the semester, to calculate the marks obtained in the unit tests it will be considered that the candidate has got 0(zero) marks in other unit tests.
 - v) There is separate passing in theory examination. A candidate has to secure minimum 28 marks(i.e.40%) out of 70 marks to declare him/her pass. Provisional marks obtained by the candidate in unit tests should reflect as proportional to the marks obtained in theory examination. In case of disparity of more than 15% it will be scaled down accordingly. These marks will be final marks obtained by the student. No scaling up is permitted.
 - vi) Unit test marks will be added in theory examination marks only after passing of candidate in theory examination in respective subject.
- Paper pattern for the unit tests:
- All questions are compulsory with weightage as following:

Question 1	-	10 marks
Question 2	-	10 marks
Question 3	-	10 marks
- For granting the term it is mandatory to appear for all the three unit tests conducted in each semester.
- Roll numbers allotted to the students shall be the examination numbers for the unit tests.



SEMESTER - I





K20501: ADVANCED FLUID MECHANICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

T. W. : 25 Marks

Or. : 25 Marks

Unit-I

(08 Hours)

Kinematics of Flow: Flow visualization, stream lines, streak lines, path lines, continuity equation in cartesian and cylindrical polar coordinates system, accelerations, rotation, vorticity.

Unit-II

(08 Hours)

Velocity potential and stream function, flow-net, Laplace equation and its solution by graphical and relaxation methods, simple flow patterns.

Unit-III

(08 Hours)

Dynamics of Flow: Integration of Euler's equation along streamline and in cartesian coordinate system. Bernoulli's equation, momentum equation, applications of energy and momentum equations to different problems.

Unit-IV

(08 Hours)

Navier-Stokes equations for incompressible fluids, Stokes law, creeping flow, Helle-shaw motion, flow between parallel plates, flow near suddenly accelerated plate, flow in a circular pipe. Review of dimensional analysis, drag on immersed bodies.

Unit-V

(08 Hours)

Boundary layer on flat plate, b. L. equations, Blasius solution, Karman's momentum and Integral equation, laminar and turbulent boundary layers, transition mechanisms, b.L.separation

Unit-VI

(08 Hours)

Turbulent Flow: Nature of turbulence, scales of turbulence, different averages, Reynolds rules of averaging, Reynolds equations, statistical

approach, isotropic and homogeneous turbulence, spectrum of turbulence.
Velocity distribution in pipes, resistance diagram, pipe flow problems.

Text Books/References

- Shames, "Mechanics of Fluids", McGraw Hill
- Rouse H. Ed, "Advanced Fluid Mechanics", John Wiley, 1959
- Schlichting H., "Boundary Layer Theory", McGraw Hill series in Mechanical Engineering
- Garde R. J., "Turbulent Flow", New Age Publisher, New Delhi, 1994
- Garde R. J., Mirajgaoker A. G., "Engineering Fluid Mechanics", SciTech Publisher, Chennai, 2004

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

T. W. : 25 Marks

Or. : 25 Marks

Unit-I

(08 Hours)

Water Resources of India: Land resources of India, water sources per capita water availability, Irrigation potential, methods of assessment of water resources.

Unit-II

(08 Hours)

Water Resources Development: Objectives, planning for water resources development, water resources system design, economics of water resources development, micro and macro economics, discounting factors, discounting techniques – present worth, rate of return, benefit cost analysis, annual cost methods, profitability analysis.

Unit-III

(08 Hours)

Integrated and conjunctive use of water, allocating water for various uses. Irrigation water management, constraints in irrigation development. National water policy.

Unit-IV

(08 Hours)

Augmentation of water resources: Conservation of water, augmentation of water resources, method of artificial recharge.

Unit-V

(08 Hours)

Water quality: Quality of water for irrigation and municipal use, water pollution and its control. Development of water resources and environment. Environmental impacts of water storage reservoirs.

Unit-VI

(08 Hours)

Water logging and land reclamation: Causes of water logging, anti logging measures, factors responsible for formation of saline and alkali soils, ill effects of salinity and alkalinity, land reclamation methods.

Text Books/References

- Ray K. Linsley, Joseph B. Franzini, "Water Resources Engineering", McGraw Hill Publication
- R. K. Sharma, T. K. Sharma, "Hydrology and Water Resources Engineering", Dhanpat Rai Publication
- P. P. Mujumdar, Vedula, "Water Resources Engineering", Tata McGraw Hill Publications.

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



K20503: COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 70 Marks
Duration : 03 Hours
Unit Test : 30 Marks

Unit-I

(08 Hours)

Complex Variables:

Function of complex variables, Analytic function, Cauchy-Riemann equations (Cartesian and polar form), Harmonic functions, Construction of Analytic function, Milne-Thompson method.

Unit-II

(08 Hours)

Complex Variables:

Transformations or Mapping, Conformal mapping, Bilinear transformations, The Schwarz-Christoffel transformation, Complex Integration, Cauchy's Integral theorem, Cauchy's Integral formula, Residue theorem, Taylor's and Laurent's series.

Applications to boundary value problems.

Unit-III

(08 Hours)

Numerical Solution of Partial Differential Equations:

Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.

System of Linear equations- Jacobi, Gauss Seidel, Relaxation methods.

Unit-IV

(08 Hours)

Numerical Methods:

Curve fitting : Method of least squares, Straight line, Second degree parabola, Exponential curve. Numerical Integration-General Quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule,

Weddle's rule, Newton-Cotes Integration formulae, Gauss-Quadrature two point and three points formulae.

Unit-V

(08 Hours)

Statistics:

Measure of central tendency, measures of dispersion, Moments, Skewness and Kurtosis. Coefficient of Correlation and Regression, Multiple and Partial Correlation coefficient, Reliability of regression estimates (standard error of estimates).

Unit-VI

(08 Hours)

Probability :

Classical definition of probability, Addition and multiplication theorem of probability, Conditional Probability, Random variable, discrete and continuous random variables, Binominal, Poisson, Normal, Geometric, Exponential Beta, Gamma Distributions, Sampling distributions, Testing of Hypothesis, Large sample tests for means and proportions, small sample tests based on Chi-square test of goodness of fit and independence of attributes.

Text Books/References

- Erwin Kreyszig, "Advanced Engineering Mathematics", (Wiley Eastern Ltd. Mumbai)
- Wylie C. R., Barret L. C., "Advanced Engineering Mathematics" (McGraw-Hill)
- B.S.Grewal, "Engineering Mathematics" (Khanna Publications, Delhi)
- P.N.Vertikar & J. N. Vertikar, "Applied Mathematics" (Volume I & II) (P.V.G. Publications, Pune).
- Murray R. Spiegel, "Schaum's Outline of theory and problems of "Complex Variables" (McGraw Hill Book Company)
- S. C. Gupta & V. K. Kapoor, "Fundamentals of Mathematical Statistics", (S. Chand & Sons, Delhi)
- S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India Pvt. Ltd., New Delhi

- Irwin Miller & John E. Freund, “Probability & Statistics For Engineers”, Prentice Hall of India Pvt. Ltd., New Delhi

Syllabus for Unit Test

Unit Test 1	Units I & IV
Unit Test 2	Units II & V
Unit Test 3	Units III & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 70 Marks
Duration : 03 Hours
Unit Test : 30 Marks

Unit-I

(08 Hours)

Forms of precipitation, hydrologic cycle, climate and seasons in India. Water availability in India and world. Methods of measuring precipitation, location of rain gauge, rainfall mass curve and rainfall hyetograph, intensity-duration-frequency analysis, depth-area-duration analysis, PMP, infiltration, evaporation and evapotranspiration. Runoff: runoff components, factors affecting runoff, basin yield, runoff-rainfall relations.

Unit-II

(08 Hours)

Unit Hydro graph, S-curve and IUH, Synthetic Unit-hydrograph. Floods: Frequency analysis, normal, log-normal and Gumbel's distributions, envelope curves, empirical formulae and regional flood frequency analysis.

Unit-III

(08 Hours)

Data Analysis: Correlation, regression analysis, transformations, stochastic process, and time series analysis ,auto correlation analysis and synthetic flow generation models. Generation of random variates.

Unit-IV

(08 Hours)

Ground Water Hydraulics: Types of aquifers, vertical distribution of sub surface water, Darcy's law, Dupuits assumptions, application of Darcy's law to simple flow systems, differential equation for confined and unconfined aquifers, wells fully and partially penetrating, multiple wells, interference of wells, pumping test with steady and unsteady flow.

Unit-V

(08 Hours)

Ground Water Development: Ground water exploration, types of wells, construction and design of wells, screens, pumping equipment, ground water quality, ground water pollution.

Unit-VI

(08 Hours)

Ground water budget, seepage from surface water, artificial recharge. Potential theory: Formulation of boundary value problems, conformal mapping and its applications to simple cases.

Text Books/References

- P. Jayarami Reddy, "Textbook of Hydrology", Laxmi Publication, New Delhi
- P. Jayarami Reddy, "Stochastic Hydrology", Laxmi Publication, New Delhi
- R. H. Mccuen and W. M. Snyder, "Hydrologic Modelin Statistical Methods and Applications" Prentice Hall, New Jersey, U. S. A
- K. N. Mutreja, "Applied Hydrology", Tata McGraw Hill Publication
- V.T.Chow, "Applied Hydrology", Tata McGraw Hill Publication
- Raghunath H. M., "Ground water", New Age International Publication

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



SEMESTER - II





K20505: SEDIMENT TRANSPORT AND RIVER ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks
Duration : 03 Hours
Unit Test : 30 Marks
T.W. : 25 Marks
Oral : 25 Marks

Unit-I

(08 Hours)

Introduction: Sediment problems, significant sediment properties, beginning of sediment movement - Shields analysis, critical tractive stress of non uniform materials.

Unit-II

(08 Hours)

Bed Forms and Resistance: Description of bed forms, flow regimes, their significance, resistance analysis, different resistance laws.

Unit-III

(08 Hours)

Modes of sediment transport, bed load transport, Dubuoy's equation. Einstein's approach, Meyer Peter and Muller's equation, suspended load transport, total load transport microscopic and macroscopic methods.

Unit-IV

(08 Hours)

Design of stable channels: Regime method, Kennedy's method, Lacey's method, Blench and Simons-Albertson method and tractive force approach.

Unit-V

(08 Hours)

Sediment Measurement: Bed load measurement, suspended load measurement, erosion from catchments, aggradation, degradation, silting of reservoirs, scour around bridge piers in uniform and non-uniform sediments.

Unit-VI

(08 Hours)

Planforms and their prediction, river channel dimensions and their

analysis, river training: objectives of river training, methods of river training by guide banks, spurs, levees, cut offs, pitched island and vanes, methods of bank protection.

Text Books/References

- Garde R. J., Ranga Raju K. G., "Mechanics of Sediment Transportation and Alluvial Stream Problems", New Age International (P) Limited, New Delhi, 2004
- Garde R. J., "River Morphology", New Age International (P) Limited, New Delhi, 2006

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



K20506: WATER IMPOUNDING STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Unit-I

(08 Hours)

Concrete Dams: Forces acting on a gravity dam, earthquake force-pseudo static and dynamic response approach, load classification, stability analysis, distribution of shear and normal stresses, principal stresses.

Unit-II

(08 Hours)

Stress concentration around opening, foundation treatment, use of colgrout masonry in gravity dams, Roller Compacted Concrete Dams: Materials for R.C.C mixture, design concepts, construction methods, advantages.

Unit-III

(08 Hours)

Earth Dam: Cross section of earth dam, Seepage through dam and its foundation, stability analysis for sudden draw down condition and steady seepage condition, construction condition.

Unit-IV

(08 Hours)

Seismic effects, pore pressure, protection of upstream and down stream slopes, design of filters. Rock fill Dams: Relevant rock fill characteristic, general design principles, method of construction and compaction.

Unit-V

(08 Hours)

Spill ways: Determination of capacity, types of spillways, ogee, siphon, chute, side, shaft, their hydraulic design, crest profile, energy dissipaters and divide walls.

Unit-VI

(08 Hours)

Spillway gates: Vibration, types of gates, radial, drum, vertical lift and automatic gates. Instrumentation in Dams: necessity, measurements and their purpose, planning of installation of instruments.

Text Books/References

- Bharat Singh, Varshney R. S. "Engineering of Embankment Dams", Oxford and IBH Publishing Co.,1995
- Thomas, "The Engineering of Large Dams", John Wiley & Sons
- Varshney R. S., "Concrete Dams", Oxford and IBH Publishing Co.
- Vishcher D. L. and Hager W. H., "Dam Hydraulics", John Wiley & Sons
- "Design of Small Dams", USBR Oxford IBH Publishers

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



K20507: OPEN CHANNEL FLOW

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Unit-I

(08Hours)

Basic Concepts of Fluid Flow: Classification of flow, differential form of continuity and momentum equations, energy equation, energy and momentum correction coefficients, pressure variation in vertical.

Unit-II

(08 Hours)

Steady Uniform Flow in Rigid Boundary Channels: Shear stress on the boundary, velocity distribution in the vertical, resistance laws and their limitations.

Unit-III

(08 Hours)

Stickler's equation, conveyance and section factor. Specific energy and specific energy diagram, critical depth in rectangular and non-rectangular channels, control section, applications to transitions, specific force diagram.

Unit-IV

(08 Hours)

Rapidly varying and gradually varied flows, differential form of G.V.F equation.

Unit-V

(08 Hours)

Computation of surface profiles in prismatic and non-prismatic channels using step method, graphical integration method and standard step method. Flow over broad crested and sharp crested weirs, free over falls.

Unit-VI

(08 Hours)

Hydraulic Jump in rectangular and nonrectangular channels, location of jump. Waves and their classification: Surges, celerity.

Text Books/References

- K .G. Ranga Raju, “Flow Through Open Channels”, Tata McGraw Hill Publication 1993
- F. M. Henderson, “Open Channel Flow”, The McMillan Company, N. Y., 1966
- K. Subramanya, “Flow in Open Channels”, Tata McGraw Hill Publication, 1990
- V. T. Chow, “Open Channel Flow”, McGraw Hill Publication, 1990
- Garde R. J. & Mirajgaokar, “Engineering Fluid Mechanics”, SciTech Publishers, Chennai, 2004

Syllabus for Unit Test

Unit-I

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI

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(08 Hours)



K20508: OPTIMIZATION IN HYDRAULICS

TEACHING SCHEME

Lectures : 04 Hrs/week
Practicals : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks
Duration : 03 Hours
Unit Test : 30 Marks
T. W. : 25 Marks
Or. : 25 Marks

System concept, definition, need for systems approach, different types of system parameter and variables. Linear Programming: Formulation of problem, graphical Solutions, simplex method, Big M method, duality, sensitivity analysis.

Unit-II

(08 Hours)

Transportation problems-BFS-Optimality test, maximization problems. Assignment Problems - minimization, maximization.

Unit-III

(08 Hours)

Nonlinear Programming: Unconstrained one dimensional search method, Dichotomous search method, fibonacci, golden section, multivariable unconstrained, gradient techniques, steepest ascent and descent method.

Unit-IV

(08 Hours)

Newton's method, constrained: Lagrangian multiplier techniques, Kuhn-Tuckers conditions, Dynamic Programming: Principle of optimality, recursive equation.

Unit-V

(08 Hours)

Stochastic Method: Queuing theory, characteristics -arrival and service patterns, queue discipline M/M/I systems.

Unit-VI

(08 Hours)

Simulation techniques, sequencing model. Games theory: Dominance -Solution by linear programming.

Text Books/References

- Rao S.S., "Optimization Theory and Application", Wiley Eastern Ltd.
- Richard Bronson, "Operation Research", McGraw Hill Book Co.
- Taha H.A., "Operation Research-An Introduction", Prentice Hall of India
- Wagner, "Optimization"

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI





SEMESTER - III



K20601 ELECTIVE I: HYDRAULIC MODELLING AND HYDROPOWER STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Termwork : 25 Marks

Oral : 25 Marks

Unit-I

(08 Hours)

Dimensional analysis: Units, dimensions of physical quantities, different methods of obtaining dimension less parameters viz., Rayleigh's method, method of repeating variables, matrices method Interpretation of Reynolds number, Froude number, Mach number, Euler Number and Weber number.

Unit-II

(08 Hours)

Determination of scales for models governed by Re, Fr and M number equality. Necessity of distortion of scales, scale effects. Movable bed models. Construction and operation of hydraulic models. Wind tunnels, water tunnels, generation of random and sinusoidal waves.

Unit-III

(08 Hours)

Measuring Equipments: Weirs, flow meters, bend meter, pressure transducers, hot film anemometer.

Analogies and their use (One or two visits to see models)

Unit-IV

(08 Hours)

Sluices, outlets and Galleries, Gates; Hydraulics of flow through a sluice, intake structures, aeration of sluices, outlet sluices. Radial gates, design of radial gates, automatic gates.

Unit-V

(08 Hours)

Intake structures, penstocks and pressure shafts: Location and type of intake, trash rack, intakes through concrete dams, design of intake, sediment exclusion arrangement. Types of penstocks, economical diameter

of penstock, pressure conduits in rock or concrete, anchors and supports.

Unit-VI

(08 Hours)

Surge tanks and power houses: Function of surge tanks, types, design considerations, methods of surge analysis, stability of surge tanks. Layout of power stations, turbines, types, turbine efficiency, Hydraulic design of spiral cases, Hydraulic design of draft tube, dimensioning of power house.

Text Books/References

- “Langhaar- Dimensional Analysis”
- Editor Helmut Cobus, “Hydraulic Modeling”, IAHR Bulletin no 7
- “Fluid Mechanics”, Dr. R. J. Garde Scitech Publications Chennai
- R.S.Varshane, “Hydro Power Structures”

Syllabus for Unit Test

Unit Test 1	Units I & IV
Unit Test 2	Units II & V
Unit Test 3	Units III & VI



K20601 ELECTIVE I: COASTAL ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Termwork : 25 Marks

Oral : 25 Marks

Unit-I

(08 Hours)

Basic understanding of wave mechanics including wave propagation, data analysis and prediction in coastal zone. Global tidal phenomena, Tidal analysis. Wave forces on coastal structures.

Unit-II

(08 Hours)

Coastal process-Erosion/accretion due to waves, long shore transport (Littoral drift) estimate of wave induced sediment, budget. Tides, effect of Tides, stability of inlets. Effect of construction of coastal structures on Stability of shoreline / beaches.

Unit-III

(08 Hours)

Design of Marine Structures: Seawalls, Revetments, Breakwaters-rubblemound, composite, floating and pneumatic types, and jetties. Offshore structures, Oil Production platform, sub marine pipelines. Model studies.

Unit-IV

(08 Hours)

Theory of Hydraulic Models: Dimensional analysis, physical and mathematical Modeling application to Engineering problems. Planning and Management of port and Harbors, Modern Trends in port Engineering. Port and shipping Technology and Economics.

Unit-V

(08 Hours)

Dredging Technology: Types of dredgers, design of disposal methods of dredged materials environmental effects of dredging etc. Pollution in Coastal zone Management Marine Environment-Oil spills and Containment, disposal of waste/dredged spoils etc.

Unit-VI

(08 Hours)

Coastal zone management: Activities in coastal zone, issues of concern in Integrated Coastal zone Management.

Termwork

Term work-Based on above syllabus

Text Books/References

- Brunn Per ,B. U. Naik, "Shore Protection Manual", NIOGoa
- Quinn A. D., "Port Planning", Mc Grow Hill Book Co. New York
- Richard Silvester, "Coastal Engineering", Vol-I-II, University of Western Australia
- Shore Protection Manual-U.S.Waterways Experiment Station Corps of Engineer, Costal Engineering Research Center, Vickburg andU.S.A.1984.Coastal Protection Manual 2002.
- Narasinhan and S. Kathirolu, "Harbour and Coastal Engineering", Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai

Syllabus for Unit Test

Unit Test 1	Units I & IV
Unit Test 2	Units II & V
Unit Test 3	Units III & VI



K20602 ELECTIVE II: NUMERICAL METHODS IN HYDRAULIC ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Termwork : 25 Marks

Oral : 25 Marks

Unit-I

(08 Hours)

Review of finite difference methods in Hydraulic engineering First order differential equations and their solutions. Partial differential equations.

Unit-II

(08 Hours)

Difference schemes: Accuracy and stability; consistency; truncation errors; convergence and divergence; linear and non-linear stability, dissipation and dispersion.

Explicit schemes: For linear and quasi-steady flows Implicit schemes: Forward and backward difference schemes; Leap frog method, Preissman-Cunge schemes.

Unit-III

(08 Hours)

Unsteady flow in open channels with rigid boundary Simplification of equations: Linearisation, simplifications, omissions of terms Independent and dependent variables, variables of open channel flow, continuity, and momentum equations, boundary conditions, initial conditions Characteristics of disturbances and their relation to initial and boundary conditions.

Unit-IV

(08 Hours)

Applications of unsteady flows in rigid channels and channels with sediment transport -Use of commercial ready soft wares for steady flows like HEC2, HEC RAS; and unsteady flows like HEC-6, MIKE11, etc

Unit-V

(08 Hours)

Unsteady flows in conduits; water hammer.

Unit-VI

(08 Hours)

Two and Three dimensional analysis of gravity dams.

Text Books/Reference

- Richard H. French, "Open Channel Hydraulics", McGraw Hill Publication
- R. J. Garde, "Turbulent Flow", New Age International (P) Ltd.
- Shames, "Mechanics of Fluids"

Syllabus for Unit Test

Unit Test 1	Units I & IV
Unit Test 2	Units II & V
Unit Test 3	Units III & VI



K20602 ELECTIVE II: ENVIRONMENTAL FLUID MECHANICS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 70 Marks

Duration : 03 Hours

Unit Test : 30 Marks

Termwork : 25 Marks

Oral : 25 Marks

Unit-I

(08 Hours)

Global wind currents, atmospheric boundary layer, simulation of boundary layer in wind tunnel and applications to forces on structures, use of wind tunnel for studying dispersion, diffusion. Cyclones, anti cyclones, and tornadoes, Tsunami.

Unit-II

(08 Hours)

Waves, deep and shallow water waves, braking of waves, littoral drift and sediment transport by waves, dispersion and diffusion in coastal waters, ocean out falls.

Unit-III

(08 Hours)

Vortex formation at intakes, similarity criteria, hydraulic design of sumps, design of water intakes.

Unit-IV

(08 Hours)

Heated water disposal in reservoirs and channels, mathematical considerations, solution techniques, physical modeling.

Unit-V

(08 Hours)

Thermal plumes, dispersion and diffusion in atmosphere.

Unit-VI

(08 Hours)

Dam break Problem and numerical solution.

Text Books/References

- Fisher H. B., List E. J., Imberger J. and Brooks N.H., "Mixing of Inland and Coastal Waters, Academic Press, NY, 1979
- Bernard Le, Mehaute, "Introduction to Hydrodynamics and Water Waves, Springer-Verlag", NY, 1996
- Khauss J., "Swirling Flow Problems at Intakes, Hydraulic Structure Design Manual-I", IAHR, Ed. 1987
- Fredsoe J and Deigaard R., "Mechanics of Coastal Sediment Transport"

Syllabus for Unit Test

Unit Test 1	Units I & IV
Unit Test 2	Units II & V
Unit Test 3	Units III & VI



TEACHING SCHEME

Practical : 01 Hrs/week

EXAMINATION SCHEME

Termwork : 25 Marks

Oral : 25 Marks

Each student will select a topic in the area of Hydraulic Engineering keeping track of the recent technological trends and developments. Students will make a seminar presentation using audio visual aids and submit the seminar report in the form of bound journal.





K20604 DISSERTATION STAGE I

TEACHING SCHEME

Practical : 02 Hrs/week

EXAMINATION SCHEME

Termwork : 25 Marks

Dissertation stage-I will include identification of problem, preparation of synopsis literature survey and formulation of problem.



SEMESTER - IV





TEACHING SCHEME

Practical : 04 Hrs/week

EXAMINATION SCHEME

Termwork : 150 Marks

Oral : 75 Marks

Dissertation stage-II will include experimentation, data analysis and submission of final report.



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

- A candidate who is granted term for M.Tech Semester-I will be allowed to keep term for his/her M.Tech. Semester-II examination even if he/she appears and fails or does not appear at M.Tech. Semester-I examination.
- A candidate who is granted term for M.Tech Semester-III will be allowed to keep term for his/her M.Tech. Semester-IV examination even if he/she appears and fails or does not appear at M.Tech. Semester-III examination.
- A student shall be allowed to keep term for M.Tech Semester-III even if he/she has a backlog of all Heads of passing in theory examination held at M.Tech Semester I & II taken together.
- A student has to secure 40% marks in theory and 50% marks in TW & oral as a condition of pass class. The overall percentage of marks of all semesters taken together should be more than 50% to declare the student to be passed.

CONTINUOUS ASSESSMENT

- The term work assessment will be based on the practical/assignment as described in the syllabus.
- Final assessment of termwork shall be done by pair of internal and external examiners jointly during the oral/practical examination schedule declared by the university. The teacher conducting practicals/assignments during the term shall maintain a record of continuous assessment. Every practical/term work/assignment shall be assessed continuously on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

This record of continuous assessment shall be made available to the examiners during Term work and oral examination. Examiner shall use this record for overall assessment of the performance of the student.

- Assessment of the seminar work and dissertation work shall be done continuously.

- Record of this assessment shall be made available during examination. The student should submit the dissertation stage-I report along with the dissertation stage-II report at the time of final submission.

CLASS

- The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him/her. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class