

FEDERAL PUBLIC SERVICE COMMISSION
(Curriculum & Research Wing)

Schemes and Syllabi for Screening/Professional Tests as well as Descriptive Examination
Relating to Posts Advertised under Consolidated Advertisement No. 10/2022

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
1.	158/2022	Assistant Director (Technical) (BS-17), Ministry of Water Resources.	Second Class or Grade 'C' Master's or Bachelor's (4 years education) degree in Water Resources Engineering/ Water Resources Engineering & Management/ Hydrology/ Hydraulics & Irrigation Engineering/ Hydropower Engineering/ Civil Engineering or equivalent qualification from a University recognized by the HEC/PEC.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Water resources Planning and Management • Economics of Water Resources • Agricultural Drainage • Optimal use of Irrigation Water • Water Harvesting • Dams and Hydro Power Engineering • Hydraulic Structures
2.	159/2022	Assistant Director (Technical Monitoring) (BS-17), Ministry of Water Resources.	Second Class or Grade 'C' Master's or Bachelor's (4 years education) degree in Water Resources Engineering/ Water Resources Engineering & Management/ Hydrology/ Hydraulics & Irrigation Engineering/ Hydropower Engineering/ Civil Engineering or equivalent qualification from a University recognized by the HEC/PEC.	Objective Type Test (MCQ) Part-I English =20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Water resources Planning and Management • Economics of Water Resources • Agricultural Drainage • Optimal use of Irrigation Water • Water Harvesting • Dams and Hydro Power Engineering • Hydraulic Structures • Techniques for Monitoring & Evaluation of Projects.

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
3.	160/2022	<p>Lecturer/ Instructor (Chemistry) (BS-17), Military College Jhelum, Ministry of Defence.</p>	<p>Second Class or Grade 'C' Master's degree in Chemistry from a University recognized by HEC.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I English = 20 marks</p> <p>Part-II Subject Test = 50 marks</p> <p>Part-III Professional Test = 30 marks</p>	<p>Part-I Vocabulary, Grammar Usage, Sentence Structuring</p> <p>Part-II (Master's Level)</p> <ul style="list-style-type: none"> • Chemical Kinetics, • Chemical Equilibrium, • Quantum Theory of Atom, • Synthetic Chemistry & Polymers, • Reaction Mechanism, • Green Chemistry, • Spectroscopy, • Nano Technology, • Colloidal State. <p>Part-III</p> <ul style="list-style-type: none"> • Teaching Techniques and Methodology • Classroom Management and Discipline • Testing and Evaluation • Knowledge of Bloom's Taxonomy
4.	161/2022	<p>Preventive Officer (BS-16), Revenue Division, Federal Board of Revenue.</p>	<p>i. Second Class or Grade 'C' Bachelor's degree from a recognized University with Economics, Commerce, Statistics, Accounting, Computer Science, Law, Pharmacy, Chemistry or Physics as one of the subjects or B.Sc. Engineering in any speciality.</p> <p>ii. Computer literacy up to the level of MS Word, MS Power Point and MS Excel.</p> <p>NOTE: At first stage MCQs Screening Test shall be held, then on the basis of its result top merit position holders @ ten candidates per vacancy from respective quotas would be called for Descriptive Test.</p>	<p>Objective Type Test (MCQ)</p> <p>Part-I English = 20 marks</p> <p>Part-II General Intelligence Test = 80 marks</p>	<p>Part-I Grammar Usage, Sentence Structuring</p> <p>Part-II</p> <ul style="list-style-type: none"> • Basic Arithmetic <ul style="list-style-type: none"> – Algebra – Ratios – Percentages – Arithmetic Means • Current Affairs. <ul style="list-style-type: none"> – Issues/Challenges at National and International Level during the last 1 years – Basic Economic facts related to Pakistan. • Pakistan Affairs & Islamic Studies <ul style="list-style-type: none"> – Basic Level knowledge • Basic Computer Operation in MS Office <p>Note : (Equal weightage for each topic at Part-II)</p> <p>Note: For Pre-selected candidate, syllabus for Descriptive Test is at Page-4 below</p>

S. No	Case No. F.4-	Particulars of Post(s)	Qualifications/Experience for the Posts	Test Specification	Topics of Syllabi
5.	162/2022	Deputy Assistant Director (Stenography) (BS-16), Secretariat Training Institute, Cabinet Secretariat, Establishment Division.	i. Second Class or Grade 'C' Bachelor's Degree from University recognized by HEC. ii. Three (3) years post qualification experience as Stenotypist/ Stenographer iii. Certificate in Urdu/ English Shorthand and Typing from a recognized institution. iv. Speed of 80 w.p.m. in Shorthand and 40 w.p.m. in Typing at 90% accuracy or comparable figures of speed and accuracy on computer. v. Literate in Information Technology.	<ul style="list-style-type: none"> • Typing Test (Urdu/English) with minimum Speed of 40 W.P.M with 90% accuracy 35 Marks • Shorthand Test (Urdu/English) with minimum Speed of 80 W.P.M 35 Marks • Computer Literacy Test: <ul style="list-style-type: none"> i Microsoft Word (Typing, Formatting) 10 Marks ii Microsoft Excel (Typing, Graph, Calculations) 10 Marks iii Microsoft Power Point (Typing, Formatting, Inserting Objects) 10 Marks <p>NOTE: (i) Typing test would be hold on computers through relevant English/ Urdu softwares. (ii) I.T/ Computer Literacy means proficiency in relevant English/ Urdu Softwares.</p>	
6.	163/2022	Accounts Officer (BS-17), Pakistan Mint, Lahore, Finance Division.	Second Class or Grade 'C' Master's Degree in Business Administration (Banking/ Finance/ Accounts)/ Commerce/ ICMA or equivalent qualification from a University recognized by the HEC.	Objective Type Test (MCQ) Part-I English = 20 marks Part-II Professional Test=80 marks	Part-I Vocabulary, Grammar Usage, Sentence Structuring Part-II <ul style="list-style-type: none"> • Accounting Principles & Procedures, • Scrutiny of Records for Audit Purposes • Journal, Ledger & Cash Book, • Preparation of Annual Budget, • Financial Planning and Cost Accounting • Heads of Accounts, Re-appropriation of Funds and Supplementary Grants • Settlement of Audit Objections. • Public Procurement Rules, 2004 • Basic Mathematics (Average, Ratio etc.) • Basic IT Knowledge

Syllabus for Descriptive Test of
F.4-161/2022-R (Preventive Officer (BS-16))

Max Marks: 100

Qualifying Standard 40%

Time Allowed: 3 Hours

Part-I (English Essay): 40 Marks

Candidates will be required to write an Essay in English comprising **1000 words** from a set of **four given topics**. Candidates are expected to reflect comprehensive knowledge on a selected topic. Candidate's articulation, expression and technical approach to the style of English Essay writing will be examined.

Part-II (Current Affairs): 30 Marks

Candidates will be expected to demonstrate knowledge on current affairs related to the following:

- CPEC and Pakistan,
- Kashmir Issue,
- Pak US relations
- Afghanistan Crisis
- Basic Economic facts related to Pakistan

Part-III (Islamic Studies/Pakistan Studies): 30 Marks

I. Islamic Studies

Introduction to Islam, Seerah of the Prophet Muhammad (PBUH) as Role Model, Status of Woman in Islam, Articles of Faith, Islamic Code of Life, Islamic Concept of Human Rights

II. Pakistan Studies

Parliamentary democracy in Pakistan under 1973 Constitution, Salient features of the Constitution of Pakistan 1973, Economic Challenges for Pakistan, Major social problems of Pakistan.

SUGGESTED READINGS

S.No.	Title	Author
1.	Pakistan and World Affairs	Shamshad Ahmad (Edition-2015)
2.	Constitution of Pakistan 1973	
3.	Kashmir in Conflict: India, Pakistan and the Unending War.	Schofield, Victoria. New York: I.B.Tauria, 2003.
4.	Modern South Asia: History, Culture, Political Economy.	Jalal, Aisha and Bose, Sugata. New York: Routledge, 1998.
5.	Federalism and Ethnic Conflict Regulation in India and Pakistan.	Adeney, Katharine. , New York: Palgrave Macmillan, 2007.
6.	Issues in Pakistan's Economy	S. Akbar Zaidi
7.	Economic Survey of Pakistan	Government Publication
For Islamic Studies		
8.	Introduction to Islam	Dr. Hamidullah
9.	Islam: its meaning and Message	Khurshid Ahmad
10.	Insan e Kamil	Dr Khalid Alvi
11.	Islami Tehzeeb Kay Chund Darakhshan Pehloo	Mustafa Sabali

**Schemes and Syllabi for Written Examination (Descriptive) for Posts in
BS-20 advertised under Consolidated Advertisement No. 10/2022**

Case No.	F.4-154/2022-R
Particulars of post	Director General (Water Resources Development) (BS-20), Ministry of Water Resources.
Minimum Qualification & Experience:	<p>i. Ph.D. or M. Phil./MS or Second Class or Grade 'C' Master's or Bachelor's (4 years education) degree in Water Resources Engineering/ Water Resources & Management/ Hydrology/ Hydraulics & Irrigation Engineering/ Hydropower Engineering/ Civil Engineering or equivalent qualification from a University recognized by the HEC/PEC.</p> <p>ii. Thirteen (13) years post qualification experience in case of Ph.D. or Fifteen (15) years post qualification experience in case of M. Phil./ MS or Seventeen (17) years post qualification experience in case of Master's or Bachelor's (4 years education) degree in the relevant field of educational qualification in BS-17 and/ or above or equivalent in any Government/ Semi-Government/ Autonomous/ Public / Private Sector Organization.</p>

PAPER: PROFESSIONAL (100 MARKS)

Analysis Paper: Candidates will be required to analyse a situation related to advertised post and suggest/draw suitable solution comprising approximately **1000 words**. Candidate's research based knowledge as well as articulation, expression and technical treatment of the situation will be examined.

OR

Case Study: Candidates will be given real situation case studies related to advertised posts/ organization concerned and will be expected from the candidates to present (i) identification of issues (ii) evaluation of issues (iii) legal or case related theories (iv) evaluation of case facts if required and (v) possible solution of the case or writing judicial order, if the case so requires.

Schemes and Syllabi for Written Examination (Descriptive) for All Posts in BS-18 & BS-19 included in Consolidated Advertisement No. 10/2022

PAPER-I: ENGLISH

Max Marks: 100

Time Allowed: 3 Hours

- (i) **English Essay-50 Marks:** Candidates will be required to write an Essay in English comprising **1500 words** from a set of **six given topics**. Candidates are expected to reflect comprehensive and research based knowledge on a selected topic. Candidate's articulation, expression and technical approach to the style of English Essay writing will be examined.
- (ii) **English (Composition and Précis)-50 Marks:**
The examination will test the candidate's abilities to handle Précis Writing, Reading Comprehension, Sentence Structuring, Translation, Grammar and Vocabulary, etc.
- Précis Writing (10 marks):** A selected passage with an orientation of generic understanding and enough flexibility for compression shall be given for précising and suggesting an appropriate title.
- Reading Comprehension (10 marks):** A selected passage that is rich in substance but not very technical or discipline-specific shall be given, followed by five questions, each carrying 2 marks.
- Grammar and Vocabulary (10 marks):** Correct usage of Tense, Articles, Prepositions, Conjunctions, Punctuation, Phrasal Verbs, Synonyms and Antonyms etc.
- Sentence Correction (5 marks):** Ten sentences shall be given each having a clear structural flaw in terms of grammar or punctuation. The candidates shall be asked to rewrite them with really needed correction only, without marking unnecessary alterations. No two or more sentences should have exactly the same problem, and 2-3 sentences shall be based on correction of punctuation marks.
- Grouping of Words (5 marks):** A random list of ten words of moderate standard (neither very easy nor utterly unfamiliar) shall be given, to be grouped by the candidates in pairs of those having similar or opposite meaning, as may be clearly directed in the question.
- Pairs of Words (5 marks):** Five pairs shall be given of seemingly similar words with different meanings, generally confused in communication, for bringing out the difference in meaning of any five of them by first explaining them in parenthesis and then using them in sentences.
- Translation (5 marks):** Ten short Urdu sentences involving structural composition, significant terms and figurative/idiomatic expressions shall be given, to be accurately translated in English.

SUGGESTED READINGS

Sr. No.	Title	Author
1.	English Grammar in Use	Raymond Murphy (Cambridge University Press)
2.	Practical English Usage	M. Swan (Oxford University Press)
3.	The Little, Brown Handbook	H. Ramsey Flower & Jane Aaron (The Little, Brown & Co; Harper Collins)
4.	A University English Grammar	R. Quirk & S. Greenbaum (ELBS; Longmans)
5.	Write Better, Speak Better	Readers Digest Association
6.	Modern English in Action	Henry Christ (D.C. Heath & Co.)
7.	Exploring the World of English	Syed Saadat Ali Shah

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

Case No.	F.4-155/2022-R
Particulars of post	Director (Water & Hydropower) (BS-19), Ministry of Water Resources.
Minimum Qualification & Experience:	<p>i) M. Phil./MS or Second Class or Grade 'C' Master's or Bachelor's (4 years education) degree in Water Resources Engineering/ Water Resources Engineering & Management/ Hydrology/ Hydraulics & Irrigation Engineering/ Hydropower Engineering/ Civil Engineering or equivalent qualification from a University recognized by the HEC/ PEC.</p> <p>ii) Ten (10) years post qualification experience in case of M.Phil/ MS. Or Twelve (12) years post qualification experience in case of Master's or Bachelors (4 years education) degree in the relevant field of educational qualification in BS-17 and/ or above or equivalent in any Government/ Semi-Government/ Autonomous/ Public/ Private Sector Organization.</p>

Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II: (Professional) (Subjective)**75 Marks****I. Water Resources Planning and Management**

Present Status of Water Resources; water usage in agriculture, urban and rural sector, hydropower; water resources development potential; future challenges and options. Surface Water resources Development and Utilization: history of irrigation; Indus Water Treaty (1960); Water Apportionment Accord, trans-boundary issues. Surface Water Resources Development and Utilization: major rivers of Pakistan; average volume of water received; annual rainfall, seasonal inflow, water quality, sediments in rivers and reservoirs; harnessing of hill torrents; flood protection programme. Groundwater Resources Development and Utilization: necessity, aquifers, quality, recharge, extraction, development potential, mining, water table control, artificial recharge of groundwater. Planning and Management Issues: institutional objectives and constraints, management and sustainability issues - equity in water distribution, operation, management, cost recovery and water delivery efficiencies; role of modeling, its advantages and limitations;

II. Economics of Water Resources

Importance of economics in water management, cases and examples in which economics can play or have played a role, principles of water management economics, economic approaches to managing water, including quantity and price based policy instruments, institutional role, and benefit-cost analysis, money-time relationships, present and future worth of capital, cash flow diagrams

III. Optimal Use of Irrigation Water

Introduction: crop water use, concept of relative yield and relative evapotranspiration, FAO method and its limitations, difference between seasonal ET deficit and ET deficit within a growth cycle. Elementary Optimization Principles and Practices: choice of crop and variety, comparison of late vs. early varieties, adapting cropped area to water application (concept of full and deficit irrigation), distributing water deficit between crops in dependence of the sensitivity to seasonal and periodical water stress. Varying Sowing Dates and Staggering: shifting of crop water requirements and irrigation requirements in time and quantity, staggering sowing/planting; attenuating crop water requirements and irrigation requirements, effects of staggering. Irrigation.

IV. Dams and Hydro Power Engineering

Prediction of sediment distribution; Estimation of life of a reservoir. Operation and Maintenance of small dams: Maintenance of spillways, outlet pipes, earth embankments and foundation, storage dams, diversion dams, flood detention reservoirs; emergency preparedness plan, periodic examination and evaluation, reservoirs problem, silting seepage control, toxic algae, reservoir safety, marine life. Selection of hydropower sites, Components and layout of hydropower schemes, General Arrangement of components of a typical RoR plant: Spillways, undersluices, General

requirements of a functional RoR headworks, Intakes of RoR headworks: Location, Non pressure and pressurized intakes, General arrangement of intake, Control of bed load and floating debris in RoR intakes, Sediment Handling measures: Methods of bed load and suspended load handling in RoR headworks, Design of settling basin (Particle and concentration approach), Estimation of sediment volume in Settling basin, Flushing of deposited sediment, estimation of frequency of flushing, Type of turbines, Pelton, Francis, Kaplan and Bulb turbines and their performance characteristics, Selection of turbines and their specific speed, Turbine setting, Preliminary design of francis and pelton turbines, Scroll case and draft tubes, their importance,

V. Hydraulic Structures

- Canal Falls, flumes, canal outlets
- Cross drainage works: types and functions

VI. Climate Change and Water Resources

Atmospheric structure, overview of earth system processes, earth's energy balance, meso, micro, macro climate, atmospheric circulation and climate, clouds and climate, carbon cycle, anthropogenic and natural forcing, radiative forcing and global warming, greenhouse gases and green house effect history of past climate, recent climate change, carbon dioxide and energy use, surface temperature record, connections with our world, trend analysis of meteorological and oceanographic parameters, future predictions and impact, comparison of computer simulations of past climate with temperature records, computer projections of future climate change, the role of the hydrological cycle in the climate system, decade long precipitation variations and water resources, water availability and demand in south Asia, climate change and water resources, climate change and future water challenges, hydrologic models, global warming and the acceleration of the hydrological cycle, assessing of hydrology on regional and smaller scales, advantages and limitations of hydrologic models in climate, application of hydrologic models for climate change impact.

VII. International Water Treaties

- Explaining Conflict, Cooperation and Agreements about International Rivers
- Treaty Design and Property Rights: Theory and Hypotheses
- Empirical Analysis of Treaty Design Differences: Through-border and Border-creator Configurations.
- Empirical Analysis of Treaty Design Differences

VIII. Project Management

Introduction to Project Management: Definition of a Project, Importance of Project Management, Project Life Cycle, Types of Projects, Project Management and related Industries, Project Initiation and Selection, Project Manager, Project Organization, Project Planning, Conflicts and Negotiation, Project Implementation, Budgeting and Cost Estimation, Scheduling, Resource Allocation, Monitoring and Information Systems, Project Control. Project Feasibility Study: How to prepare Project Feasibility Study, Format of Feasibility Study, Contents of Feasibility Study, Making Accurate Estimates, Students' presentations of feasibility studies. Project Monitoring, Project Evaluation.

IX. Water Accord, 1991

Salient features of Water Accord, 1991 between the provinces of Pakistan, functioning of IRSA, Impact of IRSA on the water distribution for irrigation purposes.

Suggested Reading

S. No.	Title	Author
1.	Water Resources Economics: The Analysis of Scarcity, Policies and Projects.	Griffin, R. C.
2.	Water Resources System Planning and Management.	Jain, S. and V. P. Singh.
3.	Water Resources of Pakistan and Their Utilization.	Ahmad, N.
4.	Introduction to the Economics of Water Resources: An International Perspective.	Merrett, S.
5.	Water Resources System Analysis with Emphasis on Conflict Resolution.	Karamouz, M., F. Szidarovszky, and B. Zahraie
6.	Fundamentals of Water Treatment Unit Processes.	Hendricks D.
7.	Water and Wastewater technology	Hammer M.J. and M.J. Hammer
8.	Sprinkle and Trickle Irrigation.	Keller, J.
9.	Handbook on Pressurized Irrigation Techniques.	Phocaides, A.
10.	Water Power Engineering,	Dandekar and Sharma,
11.	Modern Land Drainage: Planning, Design and Management of Agricultural Drainage Systems.	Smedema, L. K. W. F. Vlotman, D. W. Rycroft.
12.	Irrigation and Drainage Engineering.	Siddiqui, I. H.
13.	Climate Change and Water Resources in South Asia.	Ahmad, Q. K.
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15.	Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements.	Allen, R. G., L. S. Pereira, D Raes, and M. Smith.
16.	Water Harvesting and Watershed Management.	Jana, B. L.
17.	Water Harvesting and Spate Irrigation. On-Farm Water Management Field Manual	Govt. of Pakistan.
18.	Water Resources Engineering, McGraw-Hill, Inc.	Linslay, R. K. and Joseph, B. F.
19.	Water Resources System Planning and analysis.	Loucks, Stedinger and Haith
20.	Irrigation and Hydraulic Structures, Theory, Design and Practice	Iqbal, A,
21.	International Water Treaties: Negotiation and Cooperation Along Transboundary Rivers	Shlomi Dinar
22.	Project Management – A Managerial Approach	Jack R. Meredith & Samuel J. Mantel, Jr.
23.	Project Management – A Systems Approach to Planning, Scheduling and Controlling	Harold Kerzner

PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

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Part-I: 25 Marks (MCQ)

- 25 MCQ Questions on Part-II.

Part-II: (Professional) (Subjective)**75 Marks****I. Water Resources Planning and Management**

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- Cross drainage works: types and functions

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PAPER-II: PROFESSIONAL**Max Marks: 100****Time Allowed: 3 Hours**

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Importance of economics in water management, cases and examples in which economics can play or have played a role, principles of water management economics, economic approaches to managing water, including quantity and price based policy instruments, institutional role, and benefit-cost analysis, money-time relationships, present and future worth of capital, cash flow diagrams

III. Optimal Use of Irrigation Water

Introduction: crop water use, concept of relative yield and relative evapotranspiration, FAO method and its limitations, difference between seasonal ET deficit and ET deficit within a growth cycle. Elementary Optimization Principles and Practices: choice of crop and variety, comparison of late vs. early varieties, adapting cropped area to water application (concept of full and deficit irrigation), distributing water deficit between crops in dependence of the sensitivity to seasonal and periodical water stress. Varying Sowing Dates and Staggering: shifting of crop water requirements and irrigation requirements in time and quantity, staggering sowing/planting; attenuating crop water requirements and irrigation requirements, effects of staggering. Irrigation.

IV. Dams and Hydro Power Engineering

Prediction of sediment distribution; Estimation of life of a reservoir. Operation and Maintenance of small dams: Maintenance of spillways, outlet pipes, earth embankments and foundation, storage dams, diversion dams, flood detention reservoirs; emergency preparedness plan, periodic examination and evaluation, reservoirs problem, silting seepage control, toxic algae, reservoir safety, marine life. Selection of hydropower sites, Components and layout of hydropower schemes, General Arrangement of components of a typical RoR plant: Spillways, undersluices, General requirements of a functional RoR headworks, Intakes of RoR headworks: Location, Non pressure

and pressurized intakes, General arrangement of intake, Control of bed load and floating debris in RoR intakes, Sediment Handling measures: Methods of bed load and suspended load handling in RoR headworks, Design of settling basin (Particle and concentration approach), Estimation of sediment volume in Settling basin, Flushing of deposited sediment, estimation of frequency of flushing, Type of turbines, Pelton, Francis, Kaplan and Bulb turbines and their performance characteristics, Selection of turbines and their specific speed, Turbine setting, Preliminary design of francis and pelton turbines, Scroll case and draft tubes, their importance,

V. Hydraulic Structures

- Canal Falls, flumes, canal outlets
- Cross drainage works: types and functions

VI. Climate Change and Water Resources

Atmospheric structure, overview of earth system processes, earth's energy balance, meso, micro, macro climate, atmospheric circulation and climate, clouds and climate, carbon cycle, anthropogenic and natural forcing, radiative forcing and global warming, greenhouse gases and green house effect history of past climate, recent climate change, carbon dioxide and energy use, surface temperature record, connections with our world, trend analysis of meteorological and oceanographic parameters, future predictions and impact, comparison of computer simulations of past climate with temperature records, computer projections of future climate change, the role of the hydrological cycle in the climate system, decade long precipitation variations and water resources, water availability and demand in south Asia, climate change and water resources, climate change and future water challenges, hydrologic models, global warming and the acceleration of the hydrological cycle, assessing of hydrology on regional and smaller scales, advantages and limitations of hydrologic models in climate, application of hydrologic models for climate change impact.

VII. International Water Treaties

- Explaining Conflict, Cooperation and Agreements about International Rivers
- Treaty Design and Property Rights: Theory and Hypotheses
- Empirical Analysis of Treaty Design Differences: Through-border and Border-creator Configurations.
- Empirical Analysis of Treaty Design Differences

VIII. Project Management

Introduction to Project Management: Definition of a Project, Importance of Project Management, Project Life Cycle, Types of Projects, Project Management and related Industries, Project Initiation and Selection, Project Manager, Project Organization, Project Planning, Conflicts and Negotiation, Project Implementation, Budgeting and Cost Estimation, Scheduling, Resource Allocation, Monitoring and Information Systems, Project Control. Project Feasibility Study: How to prepare Project Feasibility Study, Format of Feasibility Study, Contents of Feasibility Study, Making Accurate Estimates, Students' presentations of feasibility studies. Project Monitoring, Project Evaluation.

IX. Water Accord, 1991

Salient features of Water Accord, 1991 between the provinces of Pakistan, functioning of IRSA, Impact of IRSA on the water distribution for irrigation purposes.

Suggested Reading

S. No.	Title	Author
1.	Water Resources Economics: The Analysis of Scarcity, Policies and Projects.	Griffin, R. C.
2.	Water Resources System Planning and Management.	Jain, S. and V. P. Singh.
3.	Water Resources of Pakistan and Their Utilization.	Ahmad, N.
4.	Introduction to the Economics of Water Resources: An International Perspective.	Merrett, S.
5.	Water Resources System Analysis with Emphasis on Conflict Resolution.	Karamouz, M., F. Szidarovszky, and B. Zahraie
6.	Fundamentals of Water Treatment Unit Processes.	Hendricks D.
7.	Water and Wastewater technology	Hammer M.J. and M.J. Hammer
8.	Sprinkle and Trickle Irrigation.	Keller, J.
9.	Handbook on Pressurized Irrigation Techniques.	Phocaides, A.
10.	Water Power Engineering,	Dandekar and Sharma,
11.	Modern Land Drainage: Planning, Design and Management of Agricultural Drainage Systems.	Smedema, L. K. W. F. Vlotman, D. W. Rycroft.
12.	Irrigation and Drainage Engineering.	Siddiqui, I. H.
13.	Climate Change and Water Resources in South Asia.	Ahmad, Q. K.
14.	Scheduling Irrigations: When and how much water to apply?	Hanson, B.
15.	Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements.	Allen, R. G., L. S. Pereira, D Raes, and M. Smith.
16.	Water Harvesting and Watershed Management.	Jana, B. L.
17.	Water Harvesting and Spate Irrigation. On-Farm Water Management Field Manual	Govt. of Pakistan.
18.	Water Resources Engineering, McGraw-Hill, Inc.	Linslay, R. K. and Joseph, B. F.
19.	Water Resources System Planning and analysis.	Loucks, Stedinger and Haith
20.	Irrigation and Hydraulic Structures, Theory, Design and Practice	Iqbal, A,
21.	International Water Treaties: Negotiation and Cooperation Along Transboundary Rivers	Shlomi Dinar
22.	Project Management – A Managerial Approach	Jack R. Meredith & Samuel J. Mantel, Jr.
23.	Project Management – A Systems Approach to Planning, Scheduling and Controlling	Harold Kerzner