EVALUATION SCHEME & SYLLABI

FOR

MASTER OF TECHNOLOGY in CIVIL ENGINEERING (INFRASTRUCTURE ENGINEERING)

(Effective from the Session: 2020-21)

Offered by

G B Pant Institute of Engineering and Technology
Ghurdauri, Pauri Garhwal, U.K. 246194

EVALUATION SCHEME
M.TECH. (Infrastructure Engineering)
I- Year (I-SEMESTER)
(Effective from session: 2020-2021)

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					
						Sessional Exam			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1	TCE-511	Project Management in Construction	3	1	0	40	40	80	120	200	4
2	TCE-512	Structural Health Monitoring	3	0	0	30	30	60	90	150	3
3	TCE-513	Soil Exploration	3	1	0	40	40	80	120	200	4
4	TCE-514	Building Information Modeling	3	0	0	30	30	60	90	150	3
5	TCE-515	Optimization and Geo-statistics in Civil Engineering	3	1	0	40	40	80	120	200	4
PRACTICALS											
6	PCE-512	Structural Health Monitoring Lab	0	0	2	10	15	25	25	50	1
7	PCE-513	Soil Exploration Lab	0	0	2	10	15	25	25	50	1
8	PCE-514	Building Information Modeling Lab	0	0	2	10	15	25	25	50	1
9	GPP-511	General Proficiency	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			15	3	6	210	275	485	615	1050	21

EVALUATION SCHEME
M.TECH. (Infrastructure Engineering)
I- Year (II-SEMESTER)
(Effective from session: 2020-2021)

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					
						Sessional Exam			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1	TCE-521	Infrastructure Planning and management	3	0	0	30	30	60	90	150	3
2	TCE-522	Construction Methods and Equipment Management	3	1	0	40	40	80	120	200	4
3	TCE-523	Urban Flooding and Disaster Management	3	0	0	30	30	60	90	150	3
4	TCE-524	Advance Water Supply and Waste Water Conveyance	3	1	0	40	40	80	120	200	4
5	TRM-521	Research Methodology and IPR	2	0	0	20	20	40	60	100	2
PRACTICALS											
6	PCE-524	Advance Water Supply and Waste Water Conveyance Lab	0	0	2	10	15	25	25	50	1
7	PCE-526	Advance Software's Lab	0	0	2	10	15	25	25	50	1
9	GPP-521	General Proficiency	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			14	2	4	180	190	370	530	900	18

EVALUATION SCHEME
M.TECH. (Infrastructure Engineering)
II- Year (III-SEMESTER)
(Effective from session: 2021-2022)

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					
						Sessional Exam			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
THEORY											
1	TCE-6xx	Elective - 1	3	1	0	40	40	80	120	200	4
2	TCE-6xx	Elective - 2	3	1	0	40	40	80	120	200	4
PRACTICALS											
3	PCE-613	Dissertation 1	0	0	20	0	250	250	250	500	10
4	GPP-631	General Proficiency	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			6	2	16	80	280	360	440	800	18

Elective 1 and 2

TCE-631 Water Resources Planning and Management
TCE-632 Ground Improvement Technique
TCE-633 Environmental Geotechnology
TCE-634 Advance Concrete Technology
TCE-635 Advanced Structural Design
TCE-636 GIS in Infrastructure Engineering
TCE-637 Environmental Impact Assessment
TCE-638 Earthquake Resistant Design and Seismology
TCE-639 Air Pollution and Control

EVALUATION SCHEME
M.TECH. (Infrastructure Engineering)
II- Year (IV-SEMESTER)
(Effective from session: 2021-2022)

S. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					
						Sessional Exam			ESE	Subject Total	Credits
			L	T	P	CT	TA	Total			
PRACTICALS											
1	PCE-614	Dissertation II	0	0	32	0	400	400	400	800	16
2	GPP-641	General Proficiency	0	0	0	0	50	50	0	50	0
SEMESTER TOTAL			0	0	32	0	450	450	400	800	16

MASTER OF TECHNOLOGY
in
CIVIL ENGINEERING
(INFRASTRUCTURE ENGINEERING)

SYLLABI
of
FIRST SEMESTER

TCE-511 PROJECT MANAGEMENT IN CONSTRUCTION 3L:1T:0P

Unit 1: Basic concepts: Scope, meaning and definition of construction project, project categories, characteristics of project, project life cycle and phases, project management functions, roles of project manager planning for construction projects, principles of planning, objectives, resource planning, scheduling, productivity chart, project tracking.

Unit 2: Project scheduling and network analysis: Introduction to, WBS, CPM, PERT, PDM, LOB, Scope management, PDRI.

Unit 3: **Resource allocation:** Time constrained resource allocation, resources levelling, project crashing and resource constrained problems, Time Cost trade off, EVM meaning and definition, project updating and control using EVM (Earned Value Management), cost performance index, schedule performance index, cost variances, schedule variance, final cost, final project duration.

Unit 4: Material related management: Material Management: importance, Integrated material Management, classification of Material, ABC analysis, standardization, purchase management, codification types and its uses, Price forecasting benefits and its methods: Average method, moving average method, weighted Average method, exponential smoothening.

Unit 5: Problems in construction: Formulation, Graphical solution, Simplex method, Dual problem, sensitivity analysis and their application to Civil engineering, Identification of risks and impact, Management Information systems.

COURSE OUTCOMES:

On successful completion of this course studentS will be able to:

1. Understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.
2. Demonstrate their capability for preparing the project networks to work out best possible time for completing the project.
3. Understand and exercise the time- cost relationship in practices.
4. Implement the safety aspects during the execution of civil engineering project.
5. Carry out the Human resource Management efficiently.

TEXTBOOKS/REFERENCES:

1. Jha K.N., Construction Project Management-Theory and Practice, 2nd Edition, Pearson India Education Services, Pvt. Ltd., UP, India, 2015.
2. Punmia B.C. and Khandelwal K. K., "Project Planning and Control with PERT and CPM", Laxmi Publication II Edition, 1989.
3. George 1. Ritz, "Total Construction Project Management", McGraw – Hill Inc1994.
4. Sengupta B., Guha M, "Construction Management and Planning", McGraw Hill Companies, 1998.
5. Jay S. Newitt, Construction Scheduling: Principles and Practices, Pearson, 2nd Edition, 2011.

TCE-512 STRUCTURAL HEALTH MONITORING 3L:0T:0P

Unit 1 Structural Health:

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

Unit 2 Structural Audit

Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit 3 Static Field Testing

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

Unit 4 Dynamic Field Testing

Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit 5 Introduction to Repairs and Rehabilitations of Structures:

Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure.

TEXTBOOKS/REFERENCES:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

TCE-513 SOIL EXPLORATION 3L:1T:0P

Unit –I Introduction to Soil Exploration

Objectives of Site Investigation, Phases of investigation, Classification, Planning for Subsurface Exploration, Fact finding and Geological survey, Reconnaissance, Preliminary Exploration, Detailed Exploration, Codal Provisions

Unit –II Methods of investigations and Sampling

Trial pits/Trenches, Borings/drilling, Auger boring, Wash boring, Percussion drilling, Rotary drilling, Sample Disturbance, Disturbed Sample, Undisturbed Samples, Sampling by standard split spoon, Sampling by thin-wall tube, Sampling by Piston sampler

Unit-III Geotechnical investigation (Semi-direct methods)

Vane Shear test, Standard Penetration Test, Pressuremeter Test, Cone Penetration Test, Dilatometer test, Rock core drilling, Sampling of rock, Core stacking, Rock Quality Designation (RQD), Total Core Recovery (TCR)

Unit –IV Geophysical Tests (Indirect methods)

Seismic reflection survey, Seismic refraction survey, Electrical resistivity Survey, Applications, Advantages, Disadvantages and Limitations

Unit-V Soil Properties and their Correlation, Soil Exploration Report

Commonly measured soil properties, Correlations of soil properties, Components of Soil Exploration Report, Drafting of Reports, Graphic Presentations of Bore Log, Study of Sample Reports

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Describe the phases of soil investigation in depth and identify the plan for soil investigation
2. Identify various methods of soil investigation and soil sampling
3. Illustrate various field test of soils and rocks
4. Review various geophysical tests in different subsoils
5. Examine components of soil exploration report and estimate properties using correlations.

TEXTBOOKS/REFERENCES:

1. Principles of Geotechnical Engineering, Braja M. Das, Cengage
2. Basic and applied Soil Mechanics, Rajan & Rao, New Age International Publishers
3. Soil Properties and their correlations, Micheal Carter and Stephen P. Bentley, Wiley Publications
4. Latest version of relevant IS codes for various tests.

TCE-514 BUILDING INFORMATION MODELLING 3L:0T:0P

Unit 1: BIM & Construction industry: Introduction to BIM, physical and functional characteristics of a building, Definition of BIM, History of BIM, Importance of BIM in construction industry.

Unit-2: BIM and Infrastructure: Components of BIM, Advantages of BIM over traditional design-build process, Use of BIM, Benefits of BIM for a construction project.

Unit-3: BIM and Modern tools: Introduction to modern tools like big data, IOT, Machine learning and Artificial Intelligence, Laser scanning. Introduction to various types of sensors and ICT. Role of above modern tools in the BIM process, scan to BIM.

Unit-4: BIM, GIS & Smart Cities: Concept and definition of GIS, Smart Cities. Linking information exchange between GIS and BIM (citygml). Understanding Smart cities and BIM. Future of BIM and its role in creating Smart Cities.

Unit-5: BIM related case studies: Application of above tools and techniques by reading related research papers.

TEXTBOOKS/REFERENCES:

1. Crotty, R: The impact of Building Information Modelling: transforming construction. London and New York: Spon Press, 2012
2. Garber, R: BIM design: realising the creative potential of building information modelling. E-Book. Chichester: John Wiley & Sons, 2014
3. Hardin, B: BIM and construction management: proven tools, methods, and workflows. Indianapolis: John Wiley & Sons, 2015
4. Kensek, K: Building Information Modeling: BIM in current and future practice. E-Book. Hoboken, NJ: John Wiley & Sons, 2014
5. Issa, R. R., & Olbina, S. (Eds.). (2015, May). Building Information Modeling: Applications and Practices. American Society of Civil Engineers

COURSE OUTCOMES:

On completion of the course, the student will be able:

1. To realize the importance of BIM in construction industry by knowing its history.
2. To understand the role of BIM as an effective project management tool in Infrastructure engineering.
3. To introduce the students to the basics of futuristic tools like AI, IOT, laser scanner etc. which will change how the construction industry works in the future.
4. To realize the interface of BIM, GIS i.e., scaling of single component to multi-component leading to conception of smart cities.

TCE-514 OPTIMIZATION TECH.S & GEO-STATISTICS IN CIVIL ENGG. 3L:1T:0P

Unit 1: Introduction to Optimization: Basics of engineering analysis and design, Need for optimal design, Difficulties associated with optimization problems, Problems of global and local optima, Single and multivariable problems, Necessary and sufficient condition for optimality.

Unit 2: Classical Optimization 1: Basics of constrained and unconstrained problems, Stationary points, points of maxima, points of minima and inflection points, Exhaustive search method, Bounding phase method, Region elimination method, Interval halving method, Golden section search method, Newton-Raphson Method and Bisection method.

Unit 3: Classical Optimization 2: Definition of descent direction, Steepest descent direction method, Newton method, Quadratic approximation of a function, Convex and concave functions, Convex optimization problem, Kuhn-Tucker conditions, Linear Programming, Simplex method and Dynamic programming, Graph theory.

Unit 4: Non Classical and Metaheuristic Optimization Algorithms: Evolutionary algorithms, Introduction to Genetic Algorithm (GA), Differential Evolution (DE), Particle Swarm Optimization (PSO), Shuffled Frog Leaping Algorithm (SFLA), Simulated Annealing (SA), Invasive Weed Growth Optimization (IWO) and other metaheuristic principles of biomimicry.

Unit 5: Geostatistics: Review of fundamentals of probability and statistics, Concepts of conditional probability, Random variables and their transformations, commonly used probability distribution functions, Principles of hypotheses testing; Principles of Monte Carlo simulation and Least squares minimization, Random fields and stochastic-dynamic systems. Spatial interpolation methods: Inverse Distance Weight method, Spline interpolation for surfaces, kriging. Applications of Geostatistics in civil engineering.

COURSE OUTCOMES:

On completion of the course, the student will be able to:

1. Determine the need for optimal design in engineering, necessary and sufficient conditions of optimality.
2. Determine the optimality of constrained and unconstrained problems using classical search techniques.
3. Determine the optimality of non-linear problems and linear problems using classical optimization methods
4. Apply evolutionary algorithms for basic problems as wells as advanced engineering design problems.
5. Apply the concepts of Geo-statistics for the engineering problems and interpolation of datasets using different techniques.

TEXT BOOKS / REFERENCES:

1. Deb. K., Optimization for engineering design: Algorithms and examples, PHI Pvt Ltd., 1998.
2. Arora., J.S., Introduction to optimum design, McGraw Hill International edition, 1989.
3. Hafta, R.T. and Gurdal. Z., Elements of structural optimization, Kluwer academic publishers, Third revised and expanded edition, 1996.
4. Hayter, A.J., Probability and statistics, Duxbury, 2002
5. Bras, R.L. and Rodriguez-Iturbe, I., Random Functions and Hydrology, Dover Publications, 1994.
6. Bennis, F. and Bhattacharjya, R.K., Nature-Inspired Methods for Metaheuristics Optimization, Springer, 2020.

PCE 512 STRUCTURAL HEALTH MONITORING (LAB) 0L:0T:2P

EXPERIMENTS:

1. Demonstration of thin piezo sensors and strain gauges.
2. Natural frequency determination of simple structural members.
3. Damage quantification using RMSD and coefficient of correlation method.
4. Acquisition of AE signals from rocks and concrete.
5. Damage localization in 2-D steel plate using piezo sensors.
6. Damage monitoring using EMI technique in steel/ aluminum members.

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Determine natural frequency determination of simple structural members.
2. Determine damage localization in steel and aluminum plate using piezo sensors.
3. Acquire AE signals from rocks and concrete.

TEXTBOOKS/REFERENCES:

1. Deraemaeker, A., Worden, K. (2010), "New trends in vibration based structural health monitoring", Springer Wien New York, USA.
2. Bhalla, S., Soh C. K. (2007), "Progress in Structural Health Monitoring and Non-Destructive Evaluation Using Piezo-Impedance Transducers", Smart Materials and Structures: New Research, Nova Science Publishers, Inc.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

PCE-513 SOIL EXPLORATION (LAB) 0L:0T:2P

EXPERIMENTS:

1. Study of various boring tools and techniques
2. Study of various sampling tools
3. Vane Shear test
4. Standard Penetration Test
5. Cone Penetration Test
6. Pressure meter Test
7. Dilatometer Test
8. Seismic refraction Test
9. Electrical resistivity Test

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Perform various soil investigation tests
2. Plan a soil investigation survey according to the structure and the sub-soil

TEXTBOOKS/REFERENCES:

1. Geotechnical Testing, Observation, and Documentation, 2nd Edition, Tim Davis, ASCE Press, 2008
2. In Situ Testing Methods in Geotechnical Engineering, Alan J. Lutenegger, CRC Press, 2021
3. Geotechnical instrumentation in practice: Purpose, performance and interpretation, ICE Publishing, 1990
4. Latest version of relevant Indian and International codes for various tests.

PCE-514 BUILDING INFORMATION MODELLING (LAB) 0L:0T:2P

EXPERIMENTS:

1. Advance commands in AutoCAD.
2. Basics of Revit.
3. Understanding Data formats for BIM i.e. CityGML/IFC.
4. Performing BIM analysis in CItyJSON format.
5. Learn interoperability between various open-source 3D model formats.
6. Using FME for reading and writing CityGML data.
7. Using QGIS to perform analysis on CityJSON data.

COURSE OUTCOMES:

On completion of the course, the student will be able:

1. To enable students to understand the various formats for data in BIM.
2. To familiarize the students with different software used for analysis of BIM
3. To practically perform analysis using the common data formats in BIM

MASTER OF TECHNOLOGY
in
CIVIL ENGINEERING
(INFRASTRUCTURE ENGINEERING)

SYLLABI
of
SECOND SEMESTER

TCE 521 INFRASTRUCTURE PLANNING AND MANAGEMENT 3L:0T:0P

Unit 1. Introduction to Infrastructure

Types of infrastructure, Role of infrastructure, Infrastructure crisis, Attributes of Infrastructure, Infrastructure and Economic Growth and poverty reduction. Indian scenario. Public Private Partnerships, Types of Private Public Partnerships (PPPs), Advantages and Disadvantages of PPP.

Unit 2. Infrastructural Sectors and their Status in India

Overview, Characteristics, Performance, Reforms and Policies, Targets, Subsidies and Privatization, Policy Initiatives, Reforms, National policies, Regulatory Authorities in Power Sector, Water sector, Transportation Infrastructure, Telecommunications Infrastructure in India

Unit 3. Urban and Rural Infrastructure in India

Urban Infrastructure: Scenario, Models of Urban Governance, Municipal Finances, Major municipal reforms, Framework for Urban Infrastructure Delivery

Rural Infrastructure: The state of rural infrastructure in India, Infrastructure and rural growth, Rural Characteristics, Strategies to improve infrastructure in rural areas

Need for Reforms, Policy Incentives for attracting Private Investment, Regulatory Measures

Unit 4. Infrastructure Economics and Finance

Infrastructure Economics, Developing Financial Models for Infrastructure, Project Finance, Net Present Value, Internal Rate of Return, Discounted Cash Flows, Perpetuities, Annuities Funding, Debt, Equity.

Infrastructure Finance Models, Numerical Practice, Project Finance, Project Finance and Project Structuring, Objectives,

Risk Allocation in Infrastructure Projects, Principles of Risk Allocation, Endogenous Risks and Exogenous risks, Mitigation, Tools, Risk Management Framework.

Unit 5. Phases of an Infrastructure Project and Miscellaneous Topics

Preliminary Feasibility, Detailed Studies and Project Structuring, Contracting and Procuring Services. Construction, Operation and Maintenance of Infrastructure Projects

Project Governance: Governability devices - relationship building, Internal Bonding Mechanisms, Coalitions and Flexibility, Models of Project Control- New Governance Model and Traditional Governance Model

Data – Base Management: Inventory data, Construction data, Performance data and Maintenance, Levels of Management, Life Cycle Management

Various Procurement Methods: Bidding Procedures: Competitive Bidding Direct Negotiations and Unsolicited Proposals, Design of Bidding Strategy, Bidding Process-Pre-qualification, Technical Proposals and Price Proposals, Critical aspects of each stage

Life-Cycle Cost Analysis (LCCA), Benefits and Limitations of LCCA, Benefit Cost Analysis (BCA), Applications and Challenges of BCA

COURSE OUTCOMES:

On the completion of course student will be able to:

1. Summarize the concept of Infrastructure and their status in India
2. Outline the details of Infrastructure Planning
3. Prepare the detailed planning process for managing an Infrastructure project
4. Differentiate the concept of Infrastructure financing from general financing and illustrate various types of project agreements

TEXTBOOKS / REFERENCES:

1. Infrastructure Planning, Parkin and Sharma, Thomas Telford Publications
2. https://www.ibef.org, India Brand Equity Foundation
3. Principles of Project Finance, E.R. Yescombe, Elsevier Publications

TCE 522 CONSTRUCTION METHODS & EQUIPMENT MANAGEMENT 3L:1T:0P

Unit 1: Introduction: Construction Sector in Indian and National Development, Role of Government and Construction Agencies, Planning for Construction projects, Project Feasibility Reports. Project Scheduling, Project management through networks (CPM & PERT), Resource allocation and project updating.

Unit 2: Planning process for construction: Cost of Owning and Operating Construction Equipment - Ownership cost, Depreciation, operating cost, and Ownership and operating costs calculation methods, Time and motion studies, Engineering Fundamentals of Moving Earth - Rolling resistance, Project financing.

Unit 3: Construction Equipment's: Earthmoving, Excavating, and Lifting Equipment Selection - Bulldozers, Front-end Loaders, Scrapers, Trucks, Excavators, Front shovels, Cranes, and Forklifts; Piles and Pile-Driving Equipment; Production of Crushed-stone Aggregate; Concreting Equipment; Batching plant, Asphalt Mix Production and Placement: Asphalt Plants, and Paving Equipment.

Unit 4: Management Information Systems in Construction Industry: Human Factors in Construction, Environmental Issues in Construction, Material Management and Construction Safety Management. Linear scheduling method, Precedence diagramming method,

Unit 5: Tenders, contracts and specifications: Methods of tendering for projects. Different types of contracts. Importance of specifications. Design and construct Tenders, Detailed project report, Build Operate and Transfer contracts, Quality Control in Construction, Equipment Financing Decision - Financing methods, Rental and lease contract considerations.

COURSE OUTCOMES:

On successful completion of the course, the students will able to:

1. Prepare the tender for various works, plan for the projects and will be able to manage the resources more appropriative.
2. Know the different equipment's required for handling different materials.
3. Identify and understand the working principle of earthwork equipment's.

TEXTBOOKS/REFERENCES:

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction equipment management for engineers, estimators, and owners, Taylor & Francis, New York, 2006.
2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning, equipment, and methods, 8th ed., McGraw Hill, New York, 2010
3. D. A. Day and N. B. H. Benjamin, Construction equipment guide, 2nd ed., Wiley, New Jersey, 1991.
4. F. Harris, Modern construction and ground engineering equipment and methods, 2nd ed., Longman, London, 1994.
5. J. Singh, Heavy construction - planning, equipment and methods, 3rd ed., CRC Press, 2009

TCE-523 URBAN FLOODING AND DISASTER MANAGEMENT 3L:0T:0P

Unit 1: Basic Concepts of hydrological phenomena: Course overview, Introduction, Why watershed hydrology & management? Water cycle, Precipitation and Interception: Formation, Intensity and types, plant canopy Interception and through fall, Measurements, Precipitation data analysis and statistical analysis of data.

Unit 2: Basic concept of Disaster Management: Vulnerability and disaster. Risk and different types. Flood and its type. Definition of risk mitigation. Different mechanism working on risk mitigation.

Unit 3: Natural Hazards Risk Management and Urban flooding: Types of natural disaster, Meaning of urban flooding, Use of GIS in hazard risk management, Disaster Risk management in different parts of India: case study of different states, Disaster Risk management in different parts of world: case study.

Unit 4: Climate Variability & Disaster Risk and Urban-Rural Risk Management: Climate change, Effect of climate change on Urban flooding, Future sustainability study due to climate change on urban flooding.

Unit 5: Watershed modelling and management: Watershed modelling and analysis: Selection, calibration and validation, Watershed management: Policy, Planning, and Economic evaluation issues in urban areas.

COURSE OUTCOMES

On the completion of course student will be able to:

1. Determine the importance of watershed management and analyse the precipitation data
2. Critique the types of disaster management and mitigation methods
3. Evaluate the natural disaster types with related cases of urban flooding
4. Analyse the variability of climate change and its corresponding impact on urban flooding
5. Design the watershed systems with policies and planning according to the economic issues in urban areas

TEXTBOOKS / REFERENCES:

1. Chow, V.T, Maidment, D.R., Mays.L.W., Applied Hydrology, McGraw Hill, 1988.
2. Tideman, E.M., Watershed Management – Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi, 1996.

TCE-524 Advance Water Supply and Waste Water Conveyance 3L:1T:0P

SYLLABUS

Unit 1: Introduction: Components of water supply systems, Water use and demand estimation, Surface water and Groundwater sources, Water quality and drinking water standards, Determination of reservoir capacity. Design period, population data and flow rates for water supply systems, Factors affecting water consumption and variation in demand.

Unit 2: Basics of Water distribution networks: Basic methods of designing water distribution networks, Basics of treatment of water distribution: Physico - Chemical Processes, Sedimentation, Coagulation, and Flocculation, Granular Media filtration, Disinfection, Adsorption and ion exchange processes. Effects of Hydraulic Transients in design of pipelines, Equations of unsteady flow in pipes, Method of characteristics, Solution procedure to solve equation of hydraulic transients using finite difference method.

Unit 3: Design of Water distribution networks: Transient cases of sudden closure of valves, pump failures and initialization of pumps, Methods of analysis for optimal distribution network design, Air valves, pressure relief valves and surge tanks and their optimal locations. Types of reservoirs and design parameters and methods; Design of water pumping stations.

Unit 4: Wastewater collection systems: Design principles, separate, combined and semi-combined sewers, Estimation of dry weather flows, Sewer Materials and Sewer Appurtenances, Sewer pipe hydraulics: sizing of pipes and design, Manhole chambers and storm water overflows.

Unit 5: Maintenance of water supply and wastewater systems: Cleaning of water towers (Overhead Tanks), Analysis of wastewater – determination of solids, COD, BOD, nutrients and their significance, BOD progression and its formulations. Pumping stations, screens and inverted screens, Regular checks of leakages from sewer lines, monitoring wells near the potential source locations.

COURSE OUTCOMES:

On the completion of course student will be able to:

1. Determine the different conditions of water demand according to the areas of urbanization
2. Analyse the basis of water distribution networks and determine the different treatment methods
3. Evaluate the cases of transients in water distribution systems and remediations to control the transients
4. Validate the different wastewater collection systems and design the collection systems
5. Examine the water quality using traditional and modern methods of testing

TEXTBOOKS / REFERENCES:

1. Chaudhry, H., Hydraulic Transients, Tata McGraw Hill, 1998.
2. Chaudhry, H., Applied hydraulic transients, Van Nostrand Reinhold, New York, 1987.
3. Streeter, V.L. and Wylie, E.B., Hydraulic Transients, McGraw Hill, New York, 1967
4. McGhee, T. J., Water Supply and Sewerage, McGraw Hill International, 1991.
5. Peavy, H.S., Rowe D.R., and George Tchobanoglous, Environmental Engineerinf, McGraw Hill, 1985.

PCE-524 Advance Water Supply and Waste Water Conveyance (lab) 0L:0T:2P

EXPERIMENTS:

1. Measurement of pH of water/waste water samples.
2. Determination of Turbidity of water samples.
3. Determination of Total Dissolved Solids in water samples.
4. Ambient Air quality monitoring (RSPM)
5. Determination of Dissolved Oxygen (D.O).
6. Determination of Biochemical Oxygen Demand (BOD).
7. Determination of Chemical Oxygen Demand (COD).
8. Determination of O&G (oil and grease)
9. Determination of Heavy metals

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Determine the pH, TS and turbidity water and waste water samples.
2. Observe and identify the Bacteriological quality of water.
3. Perform toxicity test.
4. Observe and identify the Bacteriological quality of waste water.

TEXTBOOKS/REFERENCES:

1. APHA, "Standard Methods for the Examination of Water and Wastewater", 21st Ed. Washington, 2005.
2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist, H. – Second Edition, VCH, Germany, 1992.
3. "Methods of air sampling & analysis", James P.Lodge Jr(Editor) 3rd Edition, Lewis publishers,Inc,USA,1989.
4. APHA, "Standard Methods for the Examination of Water and Wastewater", 21st Ed. Washington, 2005.
5. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist, H. – Second Edition, VCH, Germany, 1992.
6. "Methods of air sampling & analysis", James P.Lodge Jr(Editor) 3rd Edition, Lewis publishers,Inc,USA,1989.

PCE-526 ADVANCE SOFTWARE'S LAB 0L:0T:2P

EXPERIMENTS:

1. Introduction to MS Project, Quick Access Tool Bars and Ribbon Customization, Opening a File Template, Import from Excel.
2. Calendar Setting Up, Manual and Auto Schedule, Summary, Milestone and Recurring Task, Copying Task from Another Program, Work Break Down Structure, Linking Task, Task with Dates Constraints, View Task Links.
3. Resources and Adding a Work Resources, Material Resources, Cost Resources and Assigning, Duration Work and Unit, Assigning Resources to Task, Overallocation.
4. Effort Driven Scheduling, Modifying Resources, Replacing Resources, Choosing a View, Table Setting: (Column and Its Setting, Multi Windows Feature), Timeline, Sorting Tasks and Resources, Group Filter and Highlight, Formatting Bars and Text.
5. Critical Task, and Slack, Task Inspector and Splitting of Task, Delaying, Work Contours and Levelling of Resources, Updating Schedule, Overtime Work, Update Cost and Rescheduling, Project Status, Schedule and Cost Problems, Report and Printing.
6. Introduction to Primavera, Navigation Toolbars, EPS and OBS, Resources Codes and Roles, Work Break Down Structure, Budgets, User Defined Fields, Calendar, Activity Code.
7. Creating a New Project, Adding Activity, Working with Activities, Cost Account, Project Expenses, Maintaining Baseline, Updating Scheduling, Update Project with Auto Actuals Method, Update Project with Manual Method.
8. Removing Progress from Activities, Suspend and Resume Activity, Storing Past Period Performance Scheduling Project, Using Work Product and Documents, Comparing Project, Tracking Progress, Creating and Using Reflections Customising Projects.
9. Resource Levelling, Stacked Histograms, Resource Usage Spreadsheets & Activity Usage Spreadsheet, Schedule Percentage Complete & Performance Percentage Complete, Planned Value & Earned Value Curves
10. Working with Layouts, Grouping and Sorting and Filtering, Customizing Layout, Customizing Report, Printing Layout and Reports, Exporting Data From XER, XML and MS Project Formats, Importing Data From XER, XML and MS Project Formats.

COURSE OUTCOMES:

On completion of the course, the student will be able:

1. To plan, schedule and control the construction of the project.
2. To use project planning tools.
3. To carry out cost analysis and project updating.
4. To study risk analysis and resource allocation at site.

TEXTBOOKS/REFERENCES:

1. Paul E Harris, 2015, Planning and Control Using Oracle Primavera P6 Versions 8.1 to 15.1 PPM Professional.
2. Jongpil Nam,2016, Construction Scheduling With Primavera P6, AuthorHouseUK.