

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech in INFRASTRUCTURE ENGINEERING
Effective from Academic Year 2019 - 20 admitted batch

R19 COURSE STRUCTURE AND SYLLABUS

I YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Core - I	Topographic Analysis & Land Utilization Studies	3	0	0	3
Professional Core - II	Transportation & Storm Water Conservation Planning	3	0	0	3
Professional Elective - I	1. Project Planning and Financial Management 2. Planning of Ports and Harbors 3. Water Resources Systems Planning and Management	3	0	0	3
Professional Elective - II	1. Geotechniques Infrastructure 2. Infrastructure Planning for Airports 3. Building Planning and Construction	3	0	0	3
Lab - I	Numerical Analysis Lab	0	0	4	2
Lab - II	Advanced Concrete Technology Lab	0	0	4	2
	Research Methodology & IPR	2	0	0	2
Audit - I	Audit Course - I	2	0	0	0
	Total	16	0	8	18

I YEAR II – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Core - III	Construction Management and Special Equipment	3	0	0	3
Professional Core - IV	Planning of Water Supply and Sewerage Disposal Systems	3	0	0	3
Professional Elective - III	1. Advanced Concrete Technology 2. Construction Techniques 3. Urban/Regional Transportation Analysis and Planning Methods	3	0	0	3
Professional Elective - IV	1. Advanced Reinforced Concrete Design 2. Retaining Structures 3. Renewable Energy Sources	3	0	0	3
Lab - III	Transportation and Geotechnical Engineering Lab	0	0	4	2
Lab - IV	Infrastructure Engineering Lab	0	0	4	2
	Mini project with Seminar	0	0	4	2
Audit - II	Audit Course - II	2	0	0	0
	Total	14	0	12	18

II YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Elective - V	1. Waste Management Systems 2. Integrated Water Resource Management 3. Geo-Environmental Engineering	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	12	6
	Total	6	0	12	12

II YEAR II - SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	6
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	0	0	40	20

***For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.**

Audit Course I & II:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by yoga
8. Personality Development Through Life Enlightenment Skills

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING
TOPOGRAPHIC ANALYSIS AND LAND UTILIZATION STUDIES (PC - I)

Course Objectives: To impart knowledge about all the measurement techniques, to know the ground topography, modern survey equipments and be able to use different software applications in surveying.

Course Outcomes: The learner will be able to Conduct tacheometry and geodetic survey, apply knowledge of astronomy for solving civil engineering problems, explain use of aerial camera, aerial photographs and procedure of aerial survey and apply GIS in solving engineering problems

UNIT-I

Tacheometric Surveying: Introduction, purpose, principle, instruments, stadia constants, methods of tacheometry, anallatic lens, subtense bar, field work in tacheometry, reduction of readings, errors and precisions. Geodetic Surveying Principle and Classification of triangulation system Selection of base line and stations- Orders of triangulation- Triangulation figures- Station marks and signals- marking signals- Extension of base, Reduction of Centre, Selection and marking of stations

UNIT -II

Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.

UNIT -III

Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude, longitude and time corrections to the observations.

UNIT -IV

Aerial photogrammetry: Introduction, Principle, Uses, Aerial camera, Aerial 6 10 photographs, Definitions, Scale of vertical and tilted photograph, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.

UNIT-V

Modern Surveying Instruments: Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Digital self-leveling levels, scanners for topographical survey. Remote Sensing Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system. Geographical Information System Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS, and Applications in Civil Engineering

REFERENCE BOOKS:

1. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
2. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
3. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
4. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
5. Remote sensing and Image interpretation by T.M Lillesand, R.W Kiefer, and J.W Chipman, 5th edition, John Wiley and Sons India
6. Surveying theory and practice 7th Edition by James M Anderson and Edward M Mikhail Tata McGraw Hill Publication.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

TRANSPORTATION AND STORM WATER CONSERVATION PLANNING (PC - II)

UNIT-I

Storm Water and Flood Management:

Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation, case studies on flood damage

UNIT-II

Water Conservation and Recycling: Perspective on recycle and reuse, Waste water reclamation.

UNIT-III

Soil Erosion, Transportation and Sedimentation. Mechanics of soil erosion, Importance and source of sediment transport

UNIT-IV

Field investigation and survey; Mechanics of sediment transport; Deposition and estimation of transported sediments in channels and reservoirs

UNIT-V

Bed load estimation models; Estimation of sediment yield of a watershed; Sediment yield and transport models; Control of suspended and bed load movement through watershed planning and management.

REFERENCES:

1. Allam, Gamal Ibrahim Y., Decision Support System for Integrated Watershed Management, Colorado State University, 1994.
2. American Society. of Civil Engr., Watershed Management, American Soc. of Civil Engineers, New York, 1975.
3. Black Peter E., Watershed Hydrology, Prentice Hall, London, 1991.
4. Michael A.M., Irrigation Engineering, Vikas Publishing House, 1992.
5. Murty, J.V.S. "Watershed Management", New Age Intl., New Delhi 1998.
6. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994.
7. Purandare, A.P., Jaiswal A.K., Watershed Development in India, NIRD, Hyderabad, 1995.
8. Vir Singh, Raj, Watershed Planning and Management, Yash Publishing House, Bikaner, 2000.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

PROJECT PLANNING AND FINANCIAL MANAGEMENT(PE-I)

Course Objectives: To impart knowledge on project assessment and management of various aspects related to finance.

Course Outcomes: The learner will be able to prepare a bid and understand the effect of various financial aspects and on the projects.

UNIT –I

Project feasibility assessment

UNIT –II

Effects of depreciation, taxation, inflation on project feasibility.

UNIT –III

Design cost estimating. Construction cost estimates. Risk and contingency in estimates. Cost control.

UNIT –IV

Financial management for projects.

UNIT –V

Bidding and pricing. Budgeting and budgetary control.

REFERENCES:

1. Blank, L. and Tarquin, A. (2000): **Engineering Economy**, 5th Edition. New York: McGraw Hill. Peurifoy, R. L., and Oberlender, G. D. (2002):
2. **Estimating Construction Costs**, 5th Edition. New York: McGraw Hill. Damordaran, A. (1996):
3. **Investment Valuation: Tools and Techniques for Determining the Value of Any Assets:** University Edition, John Wiley and Sons, Inc. Harris, F. and McCaffer, R. (2001):
4. **Modern Construction Management**, 5th Edition. London: Blackwell. Thuessen, J. G. and Fabrycky, W. J. (2001):
5. **Engineering Economy**, Prentice Hall Halpin, D. W. (1985):
6. **Financial and Cost Concepts for Construction**, John Wiley & Sons

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING
PLANING OF PORTS & HARBOURS (PE- I)

Course Objective: To impart knowledge on port infrastructure

Course Outcomes: At the end of the course the student will be able to:

- Explain the significance of ports and harbours as a mode of transport.
- Demonstrate the fundamental principles of wave hydrodynamics and port cargo handling.
- Demonstrate the basic design of port layout
- Design, plan and integrate port and harbour infrastructure.
- Explain the construction, maintenance and renovation aspects of ports and inland waterways

UNIT-I

Introduction and Fundamentals: Introduction: Ports and harbours – an infrastructure layer between two transport media, planning of ports and harbours. The fundamentals: Tide and current conditions inside harbour, water circulation; breakwaters, jetties and quay walls; mooring, berthing and ship motion inside the port; model studies, physical and mathematical studies.

UNIT-II

Design Issues and Design Of Port: Infrastructures: Design issues: Sea port layout with regards to (1) wave action (2) siltation (3) navigability, berthing facilities. Design of Port Infrastructures: Design of port infrastructures with regards to (1) cargo handling (2) cargo storage (3) integrated transport of goods, planning multipurpose port terminals.

UNIT-III

Port Operations: Allowable wave conditions for cargo handling, wave conditions for human safety on quays and breakwaters, forecasting / nowcasting of wave and current conditions for port operations, dredging and navigability, hazard scenarios; VTMS and management of computerized container terminal, safety & environment (handling of fire, oil spill, rescue etc).

UNIT-IV

Inland Waterways and Ports: Maintenance of waterways, construction of environmentally engineered banks, dredging, and disposal processing and storing of polluted dredged materials, development of river info

UNIT-V

Construction Aspects and Sustainability: Planning and construction expansion and renovation of port and Inland Port Infrastructure. Global trade and port restructuring/reforms, impact of possible climate change scenarios, sustainable development strategies for cities and ports.

TEXT BOOKS

1. Muir Wood, A.M., and Fleming. C.A., "Coastal Hydraulics Sea and Inland Port Structures", 1st Edition, Hallstead Press, 2002.
2. Ozha & Ozha, "Dock and Harbour Engineering", 1st Edition, Charotar Books, Anand., 1990

REFERENCES

1. S.Seetharaman, "Construction Engineering and Management", 4th Edition, Umesh publications, New Delhi, 1999.
2. Richard L. Silister, "Coastal Engineering Volume I & II, Elsevier Publishers, 2000.
3. Pera Brunn, "Port Engineering", 1st Edition, Gulf Publishing Company, 200

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT(PE- I)

Course Objective: To impart knowledge water resources planning, management, linear and dynamic programming

Course Outcomes : The learner will be able to programming to water resource planning.

UNIT – I

Introduction: Concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT – II

Linear programming: Formulation linear programming models, graphical method, simplex method, application of Linear programming in water resources. Revised simplex method, duality in linear programming.

UNIT – III

Dynamic programming: Belman's of principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application of dynamic programming for resource allocation.

UNIT – IV

Non-linear optimization techniques: Classical method of optimization, Kuch-Tucker, gradient based research techniques for simple unconstrained optimization.

UNIT – V

Water –resources economics: Principles of Economics analysis, benefit cost analysis, socio economic intuitional and pricing of water resources.

REFERENCES:

1. "Operations Research ", S. D. Sharma KedarNath Ram Nath& Co.
2. "Engineering Optimization – Theory and Practice" S. S. Rao New Age International limited, Publishers.
3. Water Resources System Analysis – Vedula& Mujumdar – Tata McGraw Hill Company Ltd. 2005.
4. Water Resources Economics - James & Lee. Oxford Publishers 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING
GEOTECHNICS INFRASTRUCTURE (PE- II)

Course Objectives: To impart knowledge on site investigation and soil testing methods and design of different types of foundation appropriate to the type of soil for different structures.

Course Outcomes: the learner will be able to design shallow and deep foundations like piles for railway and highway bridges, harbor structures and also sheet piles.

UNIT – I

Site Investigation for Infrastructure Projects: methods of site investigation, types of soil samples and samplers- Geotechnical field testing – SPT, CPT, Plate Load Test, Pile Load Test.

UNIT – II

Shallow Foundations for Railway & Highway Bridges and Port & Harbour Structures: types of foundations, design forces, safe and allowable bearing capacity of shallow foundations, settlement computation;

UNIT – III

Pile Foundations for Railway & Highway Bridges and Port & Harbour Structures: Pile foundations – types, axial and lateral capacity of pile, pile group analysis and pile cap; Introduction to drilled piers, caissons, well foundations.

UNIT – IV

Foundations for Transmission Line, Radar Antenna, Microwave and TV Tower and Chimneys: Introduction, foundations for towers and chimneys, design forces, behaviour of pad and chimney foundations, design of chimney and pad foundations, anchor foundations (rock anchors), design of foundations for towers and chimneys, analysis of raft on pile foundations; design and construction of shallow foundations on rocks.

UNIT – V

Sheet Piles - introduction, types of sheet pile walls, cantilever sheet pile wall, anchored sheet pile wall, stability analysis of anchored bulkhead by free earth support and fixed earth support method, position of anchorage.

Expansive and Collapsible Soil: Difficult soils- loose granular soils, soft clays and shrinkable soils- identification, swell and swell pressure.

REFERENCES:

1. Soil Mechanics and foundation engineering – P. Purushottama Raj, Pearson Education.
2. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group.
3. Dynamic soil tests and applications – N S V Kameswara Rao, Wheeler Publishing.
4. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited.
5. IS: 4091 (1979) -Design and construction of foundations for transmission line towers
6. IS: 11233 (1985) - Design and construction of foundations for Radar Antenna, Microwave and TV Tower.
7. Principle of foundation engineering – B.M.Das, CENGAGE Learning, Thomson, Brooks/Cole.
8. Foundation Engineering -Varghese, Prentice Hall of India.
9. Foundation analysis and design – J.E. Bowles, McGraw Hill Books Company

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

INFRASTRUCTURE PLANNING FOR AIRPORTS(PE-II)

Course Objectives:

The module introduces the Airport planning issues along with the designing of Runway. The visual aids required from Airport Traffic operating are dealt with. The necessary inputs required for efficiency drainage system has significance in maintenance the airport.

Course Outcomes: At the end of the course, the student will be able to:

- Introduced the region planning for an airport.
- Design the runway length after considering the correction required for basis runway length.
- Understand the visual aids required for safe landing and takeoff operating of airport.
- Analysis and Design the drainage.

UNIT-I:

Airport Planning: General- Regional Planning- Development of New Airport- Data Required before Site Selection- Airport Site Selection- Surveys for Site Selection- Drawings to be prepared- Estimation of Future Air Traffic Needs.

UNIT-II:

Runway Design: Runway Orientation- Basic Runway Length- Corrections for Elevation, Temperature and Gradient- Airport Classification- Runway Geometric Design- Airport Capacity- Runway Configurations- Runway Intersection Design.

UNIT-III:

Structural Design Of Airport Pavements: Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay.

UNIT-IV:

Visual Aids: General- Airport Marking- Airport Lighting.

UNIT-V:

Airport Grading And Drainage: General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design- Subsurface Drainage Design.

REFERENCES:

1. Airport Planning and Designing by S.K. Khanna, M.G. Arora.
2. Highway Engineering including Expressways and Airport Engineering by Dr.L.R. Kadyali, Dr.N.B. Lal.
3. Highway Engineering including Airport Pavements by Dr.S.K. Sharma.
4. Transportation Engineering by S.P.Chandola.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

BUILDING PLANNING AND CONSTRUCTION (PE- II)

Course Objectives: To impart knowledge on Planning different types of buildings for various functionalities and to understand different aspects of construction.

Course Outcomes: Upon completion of the course the learner will be able to plan a building for different requirements and will be able to use different materials appropriately.

UNIT-I

Planning of Building Principle of planning of Buildings, Principles of Architectural design –form, function, utility, esthetics. Integrated approach inbuilt Environment, Building Rules and Byelaws Necessity of laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), marginal distances, building line control line, height regulation, room sizes, types of area calculations – built-up area, floor area, carpet area, Rules for ventilation, lighting, drainage, sanitation and parking of vehicles, Landscape elements and elements of interior decoration.

UNIT-II

Planning of residential buildings – Load bearing / Framed Structure – (a) Bungalows (b) Row houses, (c) Ownership flats, (d) Apartments. Planning of public buildings Functional requirements of Public buildings. Following types of public buildings may be considered for planning. Educational Buildings, Hostel building with Rector's and servants' quarters, Lodge/Hotel building, Primary Health center with Hospital staff quarters, factory building Administrative block and factory, Bus Stand, Library building, Shopping complex, Health club, Marriage hall, auditorium, multiplex, sports complex, restaurant, vegetable market, post office, bank and any other.

UNIT-III

(A) Stones and stone masonry: Stones– Requirements of good building stones IS specification and test on stones, Stone masonry–principal terms, detailing of constructions – procedure for UCR and CR masonry, mortar preparation, types of mortar, Pointing – Purpose and types.

(B) Brick and block masonry: Characteristics of good building bricks, IS specifications and test; Classification of bricks silica, refractory, fire etc; Brickwork–terms, types of bonds–English, Flemish, Stretcher, Header; Construction procedure, supervision, Openings in walls, mortar preparation; Block masonry– Hollow, solid, cavity wall construction; Scaffolding–types.

UNIT-IV

(A) Doors and windows: Functional requirements, materials of doors and windows, types, glazing, method of fixing doors and windows, fixtures and fastenings.

(B) Arches and lintels: Principle of arch action, Types of arches, method of arch construction, centrifugal and renewal. Lintels – necessity and types, chajja / weather shade – necessity and types

(C) Protective coatings: Plastering types and application, mortar; Painting and varnishing, types and application; White washing, distemping, oil paints; Wall cladding – materials, methods of fixing, wallpapering and glazing work.

UNIT - V

(A) Fire protection: Fire safety – fire load, Grading of occupancies by fire load, considerations in fire, protection, properties of fire-resistant construction, wall and columns, roofs and floors, wall openings, fire escape elements.

(B) Building Services : Importance of building services, Constructional requirements for different building services electrical, telecommunication and entertainment services, plumbing services layout of water supply and drainage system, storage and disposal arrangements, septic tanks, garbage disposal arrangement.

(C) Vertical circulation: Considerations in planning, design and construction; Stair types materials, fire resisting materials, design of stair, details of ramps, ladders, lifts and escalators.

(D) Steel construction: Steel construction – General purpose of steel work, sections for structural; steelwork, method connecting steel sections – bolting, riveting, welding; structural steel member and their connections – tubular structures.

TEXT BOOKS:

1. Barrid, "Building Construction" Tata McGraw Hill, New Delhi
2. Ghosh, "Materials of Construction" Tata McGraw Hill
3. Mentt, "Building Design and Constructions", Tata McGraw Hill (Second edition)
4. Shah M.G., Kale C.M. and Patki S.Y., "Building drawing an Integrated approach to Built environment", Tata McGraw Hill (Fifth edition).
5. Mentt, "Building Design and Constructions", Tata McGraw Hill (Second edition)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

NUMERICAL ANALYSIS LAB (Lab – I)

Course Outcomes: At the end of the course, students will be able to

1. Find Roots of non-linear equations by Bisection method and Newton's method.
2. Do curve fitting by least square approximations
3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jordan Method
4. To Integrate Numerically Using Trapezoidal and Simpson's Rules
5. To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.

List of Experiments:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jordan Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations By Euler's Method.
10. Numerical Solution of Ordinary Differential Equations By Runge- Kutta Method.
11. Practice with MATLAB

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

ADVANCED CONCRETE TECHNOLOGY LAB (Lab – II)

Course Outcomes: At the end of the course, students will be able to

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non-Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behavior of structural/ elements.

List of Experiments/Assignments:

1. Mix design of standard grade and high strength concrete
2. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Behavior of Beams under flexure, Shear and Torsion.
4. Fresh properties of self-compacting concrete.
5. RCPT

REFERENCE BOOKS:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
3. Concrete Technology by A.R. Santha Kumar, Oxford University Press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

RESEARCH METHODOLOGY AND IPR

Prerequisite: None

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

CONSTRUCTION MANAGEMENT AND SPECIAL EQUIPMENT (PC - III)

Course Objectives: To impart knowledge on various aspects related to the construction, New Equipment in construction, tender procedures and management aspects in construction industry.

Course Outcomes: The learner will able to prepare the tender for various works, plan for the projects and will be able to manage the resources more appropriate.

UNIT – I

Introduction, Construction Sector in Indian and National Development, Role of Government and Construction Agencies, Planning for Construction projects, Project Feasibility Reports.

UNIT – II

Project Scheduling, Project management through networks (CPM & PERT), Resource allocation and project updating

UNIT - III

Construction Equipment, Time and motion studies

UNIT – IV

Management Information Systems in Construction Industry Human Factors in Construction, Environmental Issues in Construction, Material Management, Construction Safety Management.

UNIT – V

Tenders, contracts and specifications: Methods of tendering for projects. Different types of contracts. Importance of specifications. Design and construct Tenders, Build operate and transfer contracts – Turn key contracts. Legal problems.Arbitration.Payment schedule. Quality Control in Construction, Construction Disputes and there settlement

REFERENCES:

1. Construction Engineering and Management – S. Seetharaman
2. Construction Engineering and Management – V.K. Shrivastava
3. Construction Engineering and Management – K.L. Purifoy
4. Construction Equipment - Mahesh varma

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

PLANNING OF WATER SUPPLY AND SEWERAGE DISPOSAL SYSTEMS (PC – IV)

UNIT-I

Introduction to issues in planning and management; Role of water resources systems modelling; Decision support systems (DSS); Simulation models; Optimization methods; Dynamic programming; Application in reservoir operation, etc.;

UNIT-II

Linear programming; Multi-objective optimization; Modelling uncertainty; Sensitivity and uncertainty analyses; Advances in modelling; Fuzzy optimization-applications in reservoir storage, water quality studies, etc.;

UNIT-III

Flood management; Flood plain modelling; Managing risk; Risk reduction; Decision support and prediction; Reliability-resilience-vulnerability (RRV) analysis

UNIT-IV

Sewage Disposal Systems Definition, Classification, Generation, Regulatory process, Current Management Practices, Treatment and Disposal Methods, Physicochemical processes, Biological processes, Stabilization and solidification;

UNIT-V

Thermal methods; Land disposal, Remediation of Contaminated Sites. Disposal of solid waste including sanitary landfill, planning, siting, design, closure and post-closure monitoring

TEXT BOOKS:

1. Loucks, D. P., and Van Beek, E., Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications, the UNESCO, Paris, 2005.
2. Loucks, D. P., Stedinger, J.R., and Haith, D. A., Water Resources Systems Planning and Analysis, Prentice-Hall, NJ, 1981.
3. Vedula, S., and Mujumdar, P. P., Water Resources Systems: Modelling Techniques and Analysis, Tata McGraw Hill, New Delhi, 2007.
4. Jain, S.K., and Singh, V. P., Water Resources Systems Planning and Management, Developments in Water Science, Vol. 51, Elsevier Science, New York, 2003.
5. Govindaraju, R. S., and Rao, A. R., Artificial Neural Networks in Hydrology, Water Science and Technology Library, Volume 36, Springer Netherlands, 2000.
6. Raju, K. S., and Kumar D. N., Multicriterion Analysis in Engineering and Management, Prentice-Hall, India, 2014.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

ADVANCED CONCRETE TECHNOLOGY (PE - III)

Course Objectives: This course will provide the students with

1. State-of-the art knowledge on durable and sustainable cement and concrete, on the various mineral additions and chemical admixtures to enhance the workability, strength, durability and sustainability of concrete,
2. It will empower them in the decision-making process regarding the various concrete products, construction procedures and performance test methods that will improve the durability and sustainability of concrete civil infrastructure.
3. This course will empower students to become technical leaders in the concrete. The materials science aspects of concrete production will be explored in the context of various performance criteria with emphasis on durability and sustainability.

Course Outcomes: At the end of the course, students will be able to

1. Identify Quality Control tests on concrete making materials
2. Understand the behavior of fresh and hardened concrete
3. Understand the high strength concrete properties
4. Understand the properties and need of special concrete
5. Design form work

UNIT - I

Concrete Making Materials: Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alkali Silica Reaction – Admixtures – Chemical and Mineral Admixtures.

UNIT - II

Fresh and Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.

Hardened Concrete: Abrams Law, Gel space ratios, Maturity concept – Stress strain behavior – Creep and Shrinkage – Durability Tests on Concrete – Non-Destructive Testing of Concrete.

UNIT - III

High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete.

High Performance Concrete – Requirements and Properties of High-Performance Concrete – Design Considerations

UNIT - IV

Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications.

Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – DOE Method – Light Weight Concrete, Self-Compacting Concrete.

UNIT - V

Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

REFERENCES BOOKS:

1. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000.

2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.
3. Concrete: Micro Structure by P.K. Mehta, ICI, Chennai.
4. Properties of Concrete by A.M. Neville, ELBS publications Oct 1996.
5. Concrete Technology by A.R. Santhakumar, Oxford University Press Oct 2006.
6. Concrete Technology by M.S. Shetty, S. Chand & Co 2009.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

CONSTRUCTION TECHNIQUES (PE - III)

Course Objectives:

- Understand the limitations of construction techniques.
- Analyze productivity and economics in construction techniques.

Course Outcomes: The learner will be able to implement modular construction practices. Understand reliable proportioning concepts in construction techniques.

UNIT - I:

Introduction: Introduction to Construction Techniques Reinforced and Prestressed Concrete construction, Mechanized methods of earthwork: Tractors and attachments, Dozers, Tippers, Scrapers, Shovels and Trenching machines, Dumpers, Rollers and Compactors, Estimation of quantities of earthwork in grading, Grading of sites with bulldozers and scrapers, Drilling, Blasting methods, Labor protection in drilling and blasting, Fabrication of reinforcement and transportation of erected reinforcement, Concreting, Special methods for concreting construction.

UNIT - II:

Introduction to Prestressed concrete, Advantages and Disadvantages of Prestressed concrete, Types of Pre-stressing, Methods of pre-stressing, Equipment for pre-stressing operation. Construction techniques- cantilever construction; staging method, push out technique, progressive placement construction method.

UNIT - III:

Prefabricated structures: Introduction to Prefabricated structures, Planning for pre-casting, Selection of equipment for fabrication, Transport and erection of prefabricated components, Quality measures, Design considerations of precast elements, Safety measure during erection

UNIT -IV:

Ready mixed Concrete: Production of Ready Mixed Concrete, Site mixed vs. Ready Mixed Concrete, Equipment for RMC plant, IS code provision for RMC, Quality measures of Ready Mixed Concrete, RMC Productivity analysis, Productivity analysis-Case study

UNIT - V:

Modular Construction Practices: Introduction to Modular Construction, Modular coordination, Modular Standardization, Modular System Building, Limitation and Advantages of Modular Construction Formwork: Requirements of Formwork, Loads carried by Formwork, Types of Formwork: Timber, Steel, Modular shuttering, Slip forms, Scaffolding.

TEXTBOOKS:

1. Allen E, Iano, J, Fundamentals of Building Construction subscription E Book, Material and Method, John Wiley and Sons, 2011.
2. Cameron K. Andres, Ronald C. Smith, Principles and Practices of Commercial Construction, 8 th Ed., Prentice Hall, 2009.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

URBAN/REGIONAL TRANSPORTATION ANALYSIS AND PLANNING METHODS (PE - III)

Course Objectives: To impart knowledge on traffic studies, effective transportation systems based on forecasting demand and intelligent transport systems.

Course Outcomes: The learner will be able to design suitable transportation system based on future demands

UNIT– I

Traffic studies: Background of traffic studies and surveys; Basic principles of - Speed and density, volume, headways and accidents; Road Safety auditing, Measures to increase Road safety.

UNIT– II

Statistics and Probability Concepts in Transportations Systems: Statistical Distributions – Binomial, Poisson, exponential and normal distribution, fitness tests, their application to transportation system; probability concepts in transportation studies.

UNIT – III

Transportation Demand Forecasting: Travel Demand Scenario; Demand Forecasting Approaches; Time Services Analysis as approach in demand assessment, Factor Analysis apparatus, Behavior modeling forms in travel demand estimation.

UNIT – IV

Pedestrian Delays And Gaps: Pedestrian Gap acceptance and delays; Concept of Blocks, Anti-blocks, Gaps and Non-Gaps; Underwood's analysis for Pedestrian Delays; Warrants for Pedestrian Crossing Facilities – Minimum Vehicular Volume Warrant, Minimum Pedestrian Volume Warrant, Maximum Pedestrian Volume Warrant;

UNIT – V

Intelligent Transport Systems: ITS Definition, Benefits of ITS, user services, Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Introduction to ITS applications; Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Electronic Road Pricing (ERP).

REFERENCES:

1. **Probability Concepts in Engineering Planning and Design**, Vol. II, Decision, Risk, and Reliability, New York. John Wiley & Sons. Hines, W. W., and Montgomery, D. C. (1990):
2. **Probability and Statistics in Engineering and Management Science**, 3rd Edition, New York: John Wiley & Sons. Mannering, F. L. and Kilareski, W. P. (1990):
3. **Principles of Highway Engineering & Traffic Analysis**, New York: F.L Mannering & W. P Kilareski, John Wiley & Sons publications
4. **Sensor technologies and Data requirements of ITS**, Lawrence A. Klein.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

ADVANCED REINFORCED CONCRETE DESIGN (PE - IV)

Prerequisites: Design of Reinforced Concrete Structures

Course Objectives : To impart knowledge on the behavior and design on various reinforced concrete structural elements.

Course Outcome: The learner will be able to design the reinforced concrete elements like beams, slabs and compression members.

UNIT - I

Basic Design Concepts: Behavior in flexure, Design of singly Reinforced rectangular sections, Design of Doubly Reinforced rectangular sections, Design of flanged beam sections, Design for shear – Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs short term deflections and long-term deflection estimation of crack width in RCC members, calculation of crack widths.

UNIT - II

Limit Analysis of R.C. Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems – yield line criterion – Virtual work and equilibrium methods of analysis – For square and circular slabs with simple and continuous end conditions. Moment Curvature diagram.

UNIT - III

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat Slabs-Check for one way and two-way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT - IV

Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.

UNIT - V

Design of Compression Members - Estimation of Effective Length of a Column – Code Requirements on Slenderness Limits, – Design of Short Columns Under Axial Compression – Design of Short Columns Under Compression With Uniaxial Bending – Design of Short Columns Under Axial Compression With Biaxial Bending – Design of Slender Columns sketch showing reinforcement details.

Design of Combined Footings - Distribution of Soil Pressure - Geometry of Two-column Combined Footing – Design Considerations in Two-Column Footings sketch showing reinforcement details.

REFERENCES:

1. "Reinforced Concrete Design" S. Unnikrishna Pillai & Devdas Menon; Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.
2. "Advanced Reinforced Concrete" P.C. Varghese Prentice Hall of INDIA Private Ltd. 2008.
3. "Limit State Theory and Design of Reinforced Concrete" Dr. S. R. Karve and V.L Shah. Standard Publishers, PUNE 2004.
4. "Design of Reinforced Concrete Structures" by N. Subramanian, Oxford University Press.
5. Reinforced concrete structural elements – behaviour, Analysis and design by P. Purushotham, Tata McGraw-Hill, 1994.
6. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
7. Reinforced Concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
8. "Design Reinforced Concrete Foundations" P.C. Varghese Prentice Hall of INDIA Private Ltd.
9. IS 456-2000
10. SP 16
11. SP 34

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

RETAINING STRUCTURES (PE - IV)

Course Objective: To design the earth retaining structures used in construction of road/railways/pipe lines/open excavations.

Course Outcome: Able to design conventional/Reinforced earth retaining walls, sheet pile walls, bracing system for open excavations

UNIT-I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT-II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, proportioning of retaining walls, Effect of backfill material and drainage, Static and pseudo-static analyses.

UNIT-III

Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored sheet pile wall.

UNIT-IV

Reinforced Soil Walls/Mechanically Stabilized Earth: - Failure mechanisms- Pullout and rupture failures, Analysis methods, Limit equilibrium method- Internal and external stability, Static and seismic analyses.

UNIT-V

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation.

TEXT BOOKS:

1. Clayton, C.R.I., Woods, R.I., Bond, A.J., Milititsky, J. - Earth Pressure and Earth-retaining structures, CRC Press, Taylor and Francis group, 2013.
2. Budhu, M. – Foundations and Earth retaining structures, John Wiley & Sons, Inc., 2008.

REFERENCES:

1. Bowles, J.E. – Foundation Analysis and Design, 5th Edition, BBS Publisher, 2009.
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

RENEWABLE ENERGY SOURCES (PE - IV)

UNIT-I

Solar energy: radiation measuring instrument, Basics of Flat plate collectors, Concentrators Solar Principle of photovoltaic conversion of solar energy. Application of solar energy.

UNIT-II

Wind energy: characteristics and measurement, Wind energy conversion principles, Types and classification of WECS.

UNIT-III

Biomass Energy: Classification of biomass. Physicochemical characteristics of biomass as fuel. Biomass conversion routes. Small Hydropower: Overview of micro, mini and small hydro system, types of hydro turbine;

UNIT-IV

Ocean Energy, Principle of ocean thermal energy conversion system, Principles of Wave and Tidal energy conversion.

UNIT-V

Geothermal energy: Origin of geothermal resources, type of geothermal energy deposits. Hydrogen as a source of energy. Types of fuel cell, fuel cell system.

REFERENCE BOOKS:

1. Renewable Energy by Godfrey Boyle
2. Renewable Energy Resources by John Twidell and Tony Weir

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

TRANSPORTATION AND GEOTECHNICAL ENGINEERING LAB (Lab – III)

Course Objectives: To impart knowledge about the different civil engineering materials and understand their behavior.

Course Outcomes: The learner will be able to test and interpret the results of various tests on civil engineering material

1. **Tests on Aggregates:** a) Aggregate Impact Test; b) Los Angeles Abrasion Test; c) Crushing strength of Aggregates; d) Specific Gravity and Water Absorption Test; e) Soundness test.
2. **Bitumen & Bituminous Mixes:** Bitumen grading: a) Absolute & Kinematic Viscosity; b) Penetration Test; c) Softening point; d) flash & fire point
3. Collection and preservation of disturbed and undisturbed soil samples including advanced bore and identification of relevant tests.
4. DPR preparation for soil investigation for bridge foundation designing.
5. DPR preparation for construction of typical highway.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- I YEAR- II SEMESTER
INFRASTRUCTURE ENGINEERING**

INFRASTRUCTURE ENGINEERING LAB (Lab – IV)

Course Objectives: To impart knowledge about the use of various softwares.

Course Outcomes: The learner will be able to use different software available to solve civil engineering problems.

SOFTWARES:

Relevant Commercial Software Package

List of Experiments:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Study of features estimation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering. .
6. 2-D Frame Analysis and Design
7. Steel Tabular Trass Analysis and Design
8. 3-D Frame Analysis and Design
9. Retaining Wall Analysis and Design
10. Simple tower Analysis and Design
11. Project Management using MS Project

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

WASTE MANAGEMENT SYSTEMS (PE - V)

Course Objectives: To impart knowledge on necessity of waste & waste water management, understanding treatment of Industrial waste water, Effluent treatment plants

Course Outcomes: The learner will be able to acquire the knowledge of different waste disposal techniques

UNIT – I

Introduction Solid Waste problem, Meaning and definition of solid waste, concept and classification of municipal solid waste, Impacts of solid waste on environment, Solid waste management rules and regulations

UNIT – II

Waste Disposal Techniques Introduction, composting, principles of composting, factors affecting composting, vermi composting, waste to energy techniques, Landfill technique, and design and operating procedure of landfill. Solid Waste management techniques Solid waste management Hierarchy, waste avoidance /waste prevention, Definition of source Reduction, waste reduction at source using 5R's Technique

UNIT – III

Solid waste management of Biomedical Waste, plastic and E- Waste Biomedical Waste – Sources and generation, biomedical waste management. Plastic – Dangers of plastic wastes, Recycling and disposal of plastic wastes. E-Wastes – Definition, Health hazards, E-Waste management and conclusion

UNIT-IV

Basic theories of industrial waste water management – volume reduction – strength reduction – neutralization – equalization and proportioning. Joint treatment of industrial waste and domestic sewage – consequent problems-Industrial waste water discharges into streams, lakes and oceans and problems. Recirculation of industrial wastes – use of municipal waste water in industries.

UNIT –V

Common Effluent Treatment plants –Advantages and suitability, limitations, Effluent Disposal Methods

TEXT BOOKS:

1. Solid waste management by K. Sasi Kumar & S. Gopi Krishna
2. Waste water Treatment by M.N.Rao and Dutta, Oxford and IBH, New Delhi
3. Modern Technology of Waste Management: Pollution Control, Recycling, Treatment and Utilization by NIIR board, Asia Pacific Business Press Inc.
4. Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous, McGraw-Hill.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

INTEGRATED WATER RESOURCES MANAGEMENT (PE - V)

Course Objectives: To impart knowledge on runoff, discharge measurement, estimation of flood, and flood disaster mitigation measures.

Course Outcomes: The learner will be able to estimate the quantum of water resources from different sources and able to implement and manage water resources effectively.

UNIT – I

Introduction: Definition, concepts of IWRM, approaches to iwrM, components, importance.

Surface water: Evapotranspiration – Runoff – Hydrographs – Methods of discharge measurement – Estimation of flood – Flood disaster mitigation measures and damage estimation, rainfall-runoff models.

UNIT – II

Surface water: River engineering and river training works – Hydrologic routing – Hydraulic routing – Hydrology of basin management.

UNIT – III

Ground water: Steady groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests.

UNIT – IV

Groundwater: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jacob and Chow's simplifications, Leak aquifers, Groundwater basin management.

UNIT – V

Conjunctive use: Concepts of conjunctive use Models, Case studies for IWRM.

REFERENCES:

1. Groundwater by Bawwvr, John Wiley & sons.
2. Groundwater System Planning & Management – R.Willes&W.W.G.Yeh, Prentice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.
4. Hydrology by Madanmohan das & Mimi Das Saikia PHI Learning Private Limited
5. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
6. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.
7. Engineering Hydrology by K. Subramanya, TMH Publishing Company limited,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH.- II YEAR- I SEMESTER
INFRASTRUCTURE ENGINEERING**

GEO-ENVIRONMENTAL ENGINEERING (PE - V)

Course Objective:To understand various sources of contamination of ground and to characterize contaminated ground and to find extent of contamination and to get familiarize with various remediation methods.

Course Outcome:Able to characterize the contaminated ground and identify most appropriate method of remediation

UNIT- I

Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterization methods.

UNIT- II

Solid and Hazardous Waste Management:Classification of waste, Characterization of solid Wastes, Environmental Concerns with waste, waste management strategies.

UNIT- III

Contaminant Transport:Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

UNIT- IV

Remediation Techniques:Objectives of site remediation, various active and passive methods, remediation of NAPL sites, Emerging Remediation Technologies.

UNIT- V

Landfills:Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

TEXT BOOKS:

1. Phillip B. Bedient, Refai, H. S. & Newell C. J. – Ground Water Contamination – Prentice Hall Publications, 4th Edition, 2008
2. Sharma, H. D. and Reddy, K. R. – Geoenvironmental Engineering, John Wiley & Sons (2004)

REFERENCES:

1. Rowe, R. K. – Geotechnical & Geoenvironmental Engineering Handbook, Kluwer Academic, 2001
2. Reddi, L. N. and Inyang, H. I. – Geoenvironmental Engineering Principles and Applications, Marcel. Dekker, Inc., New York (2000).
3. La Grega, M. D., Buckingham, P. L. and Evans, J. C. – Hazardous Waste Management, New York: McGraw-Hill, 2001

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:

Alphabets in Sanskrit,

UNIT-II:

Past/Present/Future Tense, Simple Sentences

UNIT-III:

Order, Introduction of roots,

UNIT-IV:

Technical information about Sanskrit Literature

UNIT-V:

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:

Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble, Salient Features.

UNIT-II:

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III:

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeamong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:

Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:

Yam and Niyam.

UNIT-III:

Do`s and Don`ts in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:

Asan and Pranayam

UNIT-V:

- i) Various yog poses and their benefits for mind & body
- ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (INFRASTRUCTURE ENGINEERING)**

**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)**

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.