



**M.Tech  
(Infrastructure Engineering  
& Management)**



## **ABOUT THE COLLEGE**

Gayatri Vidya Parishad, a premier educational trust formed and managed by renowned, eminent educationists, philanthropists and technocrats of Visakhapatnam has established “College of Engineering” in 1996 for the promotion of Quality Technical Education in Andhra Pradesh State. The college is situated on a sprawling picturesque campus of 27 acres, very near to Madhurawada on the Chennai-Kolkata national highway. The College offers seven under graduate courses i.e., Chemical Engineering, Civil Engineering, Computer Science Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Information Technology & Mechanical Engineering. All the above courses have been accredited by the NBA, AICTE. The College also offers 8 Post graduate programs, seven in Engineering and an M.C.A. GVPCOE is one of the very few engineering colleges in India which is offering a post-graduate course on Infrastructural Engineering and Management. The College is very actively involved in a number of research and consultancy projects and is offering continuing education programmes to professionals. Some of the projects undertaken by the College are design and development of a parallel kinematic machine tool, improved speed characteristics in pulsed-metal arc welding process using a rotating arc mechanism, study of noise interference in underwater telemetry applications, development of acoustic switching unit for AUV applications, design of storm water drainage system for GVMC, Basic Services for the Urban poor, the design of world-class cricket stadium for Vizag and design of a 2.5km, 45m high earthen-rockfill dam for Polavaram project for an Indo-Chinese consortium of construction companies.

## **ABOUT THE DEPARTMENT**

The Department of Civil Engineering was established in 1999 with a B.Tech course with an initial intake of 30 (which is presently 60) under the able guidance of **Prof. Dr. Ing. P.S.Rao (Former Prof. & Dean, IITM, Chennai)**. The department is led by **Prof. Dr. MV Jagannadha Rao**. The department has dedicated faculty and non-teaching staff and the laboratories are well-equipped to impart training to the students. Students are also imparted training on various value-added courses like AutoCAD, STAAD, Total Station surveying, GIS and GPS technologies. Faculty and staff are encouraged to improve their qualifications. All these efforts have brought the department the prestigious **Permanent affiliation of J.N.T.University** and 5 year **accreditation of NBA**. Very recently the department was granted permission to start an M.Tech course in Infrastructure Engineering & Management.

## ABOUT THE FACULTY

<b>Name</b>	<b>Qualification</b>	<b>Designation</b>	<b>Research Interests</b>
Dr. M.V.J. Rao	B.E. (Civil) M.Tech, Ph.D. (Hydraulics & Water Resources Engg.)	Professor & Head of the Department	Irrigation structures, Hydrology
Dr. Ing. P.S.Rao	B.Tech (Hons), M.Tech (Structural Engg, Ph.D.	Visiting Professor	RCC & PSC, Tall structures, long-span bridges, shell structures
Dr. N.S.V.V.S.J. Gandhi	B.E. (Civil), M.Tech (Soil Mechanics & Foundation Engg) Ph.D (Soil Dynamics)	Professor & Principal	Ground Improvement, Soil Dynamics
Dr. V. Viswanadham	B.Sc (Spl), B.E. (Civil), M.E (Environ Engg), Ph.D (IIT-D), Dip. In German	Professor	Ground water pollution control, industrial waste treatment, EIA
Dr. K.K.V.S.Raju	M.Sc (Tech.)-Applied Geology, Ph.D. (Geochemistry)	Visiting Professor	Geology
P.Veerabhadra Rao	B.E (Civil), M.Tech (Structural Engg)	Professor	RCC & Steel design, bridges, earthquake resistant design of structures, Cable-stayed Bridges
Dr. V.Venkata Ravi	B.E. (Civil), M.Tech (Geotechnical Engg)	Associate Professor	Numerical Modelling using FEM, Ground Improvement Techniques
M.Srinivas	B.E. (Civil), M.Tech (Geotechnical Engg)	Associate Professor	Expansive Soils, Ground Modification, Performance of pavements
M. Kishore Kumar	B.E.(Civil), M.E. (Structural Engg.)	Associate Professor	RCC, PSC, earthquake- resistant design of structures
G.Papa Rao	B.Tech (Civil), M.E. (Structural Engg)	Assistant Professor	Seismic design of RCC & Steel structures, Finite element analysis of RC & Steel structures
S.Chandra Mouli	B.E.(Civil), M.Tech (Water Resources Engg)	Assistant Professor	Water resources systems planning & management, water distribution modelling, development of hydro-electric power
A. Srinivas	B.E. (Civil Engg) M.Tech (CASAD)	Assistant Professor	On study leave and pursuing PhD programme in U.S.A
KBVN Phanindra	B.E. (Civil Engg) M.Tech (HWRE)	Assistant Professor	On study leave and pursuing PhD programme in U.S.A
P.Markandeya Raju	B.Tech (Civil), M.Tech (Structures)	Assistant Professor	RCC, PSC, Prestressing steel structures
C.J. Swamy	B.Tech (Civil), M.Tech (Hyd. & WRE)	Assistant Professor	Remote sensing and GIS, urban hydrology, ground water hydrology
M. Anil Babu	B.Tech (Civil), M.Tech (Structural Engg & Nat. Disas. Mgmt)	Assistant Professor	Fire-resistant concrete structures, earthquake resistant structures, steel structures

### INFRASTRUCTURAL FACILITIES

S.No.	Laboratory
1	Structural Engineering
2	Geotechnical Engineering
3	Fluid Mechanics & Hydraulic Machines
4	Concrete Technology
5	Transportation Engineering
6	Environmental Engineering
7	Surveying
8	Engineering Geology
9	Computer
10	Department Office*

S.No	Class Rooms	Seminar Halls	Drawing Hall
1	4	2	1

### Details of the N.T. Staff

Name	Qualifications	Designation
Smt.P.A.Bhavani	DCE	Draughts Woman
V.V.Syama Sundara Rao	B.Com	Record Assistant
Heera Singh	Draughtsman-Civil	Laboratory Technician
D. Krishna		Laboratory Technician
Y. Hanumantha Rao	B.A	Laboratory Technician
A. Vishnu Murthy	I.T.I Fitter & Electronics	Attender

### DEPARTMENTAL LIBRARY

Numbers available in the department				
Books	Journals		CDs, VCDs, Multimedia	Any Other, Please specify
	National	International		
72*	20	3+30**	42	Conference Proceedings -- 07 Indian Standard Codes -- 684

\* These books are in addition to the books available in the Central Library.

\*\* Available on net

## LIST OF NATIONAL JOURNALS

<b>S.No.</b>	<b>Name of the Journal</b>	<b>Periodicity</b>
1	Civil Engineering & Construction Review	Monthly
2	New Building Materials & Construction world	Monthly
3	Indian Concrete Journal (ICJ)	Monthly
4	Indian Highways	Monthly
5	Water & Energy Abstracts	Monthly
6	Research Alert	Monthly
7	Inside Outside	Monthly
8	Master Builder	Bi-Monthly
9	Geospatial today	Bi-Monthly
10	Indian Journal of Transport Management	Quarterly
11	Indian Geotechnical Journal	Quarterly
12	Applied Hydrology	Quarterly
13	Journal of Institute of Engineers (India) Civil Division	Quarterly
14	Journal of Structural Engineering	Quarterly
15	Bridge and Structural Engineering	Quarterly
16	Far & Near in Water and Energy	Quarterly
17	Water & Energy International	Quarterly
18	Indian Road Congress	Quarterly
19	NICMAR Journal of Construction Management	Quarterly
20	Journal of Institute of Engineers (India) Environmental Division	Half-Yearly

## LIST OF INTERNATIONAL JOURNALS

S.No.	Titles
1	International Journal of Geomechanics
2.	Journal of Aerospace Engineering
3.	Journal of Architectural Engineering
4.	Journal of Bridge Engineering
5.	Journal of Cold Region Engineering
6.	Journal of Composites for Construction
7.	Journal of Computing in Civil Engineering
8.	Journal of Construction Engineering and Management
9.	Journal of Energy Engineering
10.	Journal Engineering Mechanics
11.	Journal of Environmental Engineering
12.	Journal of Geotechnical and Geoenvironmental Engineering
13	Journal of Hydraulic Engineering
14.	Journal of Hydrologic Engineering
15.	Journal of Infrastructure Systems
16	Journal of Irrigation and Drainage Engineering
17.	Journal of Management of Engineering
18.	Journal of Materials of Civil Engineering
19.	Journal Performance of Constructed Engineering
20.	Journal of Professional Issues in Engineering and Practice
21	Journal of Structural Engineering
22.	Journal of Surveying Engineering
23.	Journal of Transportation Engineering
24.	Journal of Urban Planning and Development
25.	Journal of Water Resource Planning and Management
26.	Journal of Waterway, Port, Coastal and Ocean Engineering
27.	Leadership and Management in Engineering
28.	Natural Hazards Review
29.	Periodical of Hazardous, Toxic and Radioactive Waste Management
30.	Periodical on Structural Design and Construction

The department also has a consultancy division, which offers testing and design services to various organisations. The faculty and the non-teaching staff are actively involved in the consultancy projects.

### Details of the staff of consultancy division

Name	Qualifications	Designation
Smt.P.A.Bhavani	DCE	Draughtswoman
Sri M.R. Varma	B.A	Draughtsman
Sri S. Guna Sekhar	B.A	Draughtsman

**LIST OF SOME OF THE CONSULTANCY WORKS TAKEN UP  
BY THE CIVIL ENGINEERING DEPARTMENT**

<b>S.No.</b>	<b>Month / Year</b>	<b>Project Description</b>
1	2008	Designs for the 2.5km-long Polavaram dam
2	2008	Crude oil underground storage tank – HCC Cavern project
3	2008	Proof checking of designs of oil berths for Visakhapatnam Port Trust Container Terminal Ltd
4	2008	Proof checking of designs of the bridge across Meghadrigedda for Port Connectivity Project of NHAI
5	2007	Preparation of DPR and Master plans for storm water drains in GVMC Area under LOA for assessing funds under JNNURM
6	2007	ACA-VDCA– Preparation of plan and design for construction Quarters (G+2) with compound wall
7	2007	ACA-VDCA stadium- 'seepage' in the cellar of pavilion block-Study of the problem in detail and preparation of a comprehensive plan and proposal for a permanent solution to the 'seepage' in the cellar
8	2007	Preparation of DPR for Integrated development of Urban Infrastructure for poor settlements in GVMC under BSUP for assessing funds under JNNURM
9	2007	Design of Louvers for Port connectivity flyover for NHAI
10	2007	Scaffolding Designs for DRDO, Hyderabad
11	2007	Design of Municipal office building for Bheemili Municipal Corporation, Bheemili
12	2006	Preparation of DPR for Bridge-3, (M/s. UTKAL Alumina International Ltd., Rayagada, Orissa)
13	2006	Design of Second tier gallery stands for WEST & EAST blocks of ACA-VDCA Cricket Stadium, Visakhapatnam (ACA & VDCA, Visakhapatnam)
14	2006	Mix Design for Pre-Cast concrete pipes of 2.40m internal diameter and 250mm thick without steam-curing such that the concrete should gain 20MPa in 16hrs when the casting is removed at 6 hours after casting. (M/s. ZUBLIN International, GMBH, Germany)
15	2006	PSC boxes at Road crossings in Visakhapatnam (GVMC, Visakhapatnam)
16	2006	Design of Buildings (Phase -1), (IGIAT, Visakhapatnam)
17	Dec-2005	Topographical Survey and Alignment of DAM-5A of NALCO (M/s. NALCO., Damanjodi, Orissa)
18	Nov-2005	Extension of North Block for Press accommodation (ACA & VDCA, Visakhapatnam)
19	Oct-2005	Detailed Topographical Survey and preparation of Contours (VUDA., Vepagunta, Visakhapatnam)
20	Sept-2005	Preparation of DPR for 5 Bridges (M/s. Utkal Alumina International Ltd., Rayagada, Orissa)
21	Sept-2005	Preparation of DPR for a Road of 24 Kms (M/s. Utkal Alumina International Ltd., Rayagada, Orissa)

<b>S.No.</b>	<b>Month / Year</b>	<b>Project Description</b>
22	June-2005	Topographical Map and Block Levels data preparation (ACA & VDCA, Visakhapatnam)
23	May-2005	Detailed Topographical Survey and preparation of L-section and Cross-sections of Road length of 24 Kms. (M/s. Utkal Alumina International Ltd., Rayagada, Orissa)
24	May-2005	Soil Investigation of Polavaram Right Canal (M/s. H.C.C., Rajahmundry)
25	March-2005	Design of Cricket Score Board (ACA & VDCA, Visakhapatnam)
26	Aug-2004	Design of College Building for Dr. L.B. College (Dr. L.B. College, Visakhapatnam)
27	Aug-2004	Preparation of Detailed Longitudinal and Cross Sectional Drawings, Quantity Estimation of 6 Eastern Dams (M/s. Gayatri Projects Ltd., Damanjodi, Orissa)
28	Jan-2004	Topographical Map and Block Level Data preparation (M/s. Sterlite, Muniguda, Orissa)
29	Nov-2003	Soil Investigation for Expansion of Red Mud Soil (M/s. NALCO., Dhamanjodi, Orissa)
30	Sept-2003	Design of Pile Foundation for Storage Tank (H.P.C.L., Visakhapatnam)
31	May-2003	Design of Blast Resistance Structure (2T2 Company, Hyderabad)
32	March-2003	Advice on Casting of 40m Span PSC Girders (M/s. Navayuga Engineering Corporation, Visakhapatnam)
33	March 2003	Traffic accident study at Madillapalem, Isukathota, Raghavendra Swamy Temple and Waltair Club junctions
34	Feb-2003	Evaluation of Cement Samples (District Collector, Visakhapatnam)
35	Feb-2003	Design of North Block and Gallery Stands of Cricket Stadium at Visakhapatnam (Andhra Cricket Association, VDCA, Visakhapatnam)
36	Sept -2002	Surveying Work for Medical College site at Berhampur, Orissa (Sri. Balaji Medical Educational Trust, Gopalpur, Orissa)
37	Sept- 2002	Geo-Technical Exploration and Soil Testing for the construction of Balaji Medical College (Sri. Balaji Medical Educational Trust, Gopalpur, Orissa)
38	May-2002	Investigation into reasons of collapse of 400 kVA Transmission Line Towers at Tuni (APTRANSCO, Hyderabad)
39	1998- 99	Design of a 330m long Cable-stayed bridge for M/s. CONSTRUMA LTD., Mumbai.

## PLACEMENT RECORD

A good number of B.Tech(Civil Engineering) students obtained job offers in various companies.

<b>Year</b>	<b>Name of the company</b>	<b>No. of students selected</b>
2009 graduating batch	Infosys Technologies	2
	Maytas Infra	8
	L&T ECC Div	1
2008 graduating batch	B.Seenaiah & Co.	5
	Soma Constructions	5
	Infosys Technologies	5
	Vijay Nirman Company	3
	JMC Projects Ltd	2
	Sutherland Services	3
	TCS	1
	Satyam Computers Ltd	4
	Maytas Infra	9
	Nagarjuna Construction Company Ltd	5
	IVRCL	4
	L&T ECC Div	1
	Indu Projects	2
Infotech Enterprises Ltd	2	
2007 graduating batch	IVRCL	16
	IVRCL	1
	Infosys Technologies	1
	Maytas Infra	8
	B.Seenaiah & Co.	1
	Cognizant Technology Solutions, Hyderabad	3
	US Technology	1
2006 graduating batch	UAN Raju Construction Ltd, Visakhapatnam	5
	Erudite Engineers Pvt. Ltd., New Delhi	4
	Cognizant Technology Solutions, Hyderabad	3
	Nagarjuna Construction Company Ltd	9
2005 graduating batch	Satyam Computers Ltd	2
	Build Infotech, Hyderabad	1
	Nagarjuna Construction Company Ltd	7

## SCHEME OF INSTRUCTION (FIRST YEAR)

I – Semester					II – Semester				
S.No	Name of the subject	L	T/P	Cr	S.No	Name of the subject	L	T/P	Cr
1	Industrial Structures	3	1	3	1	Construction Economics, Finance Management and Control	3	1	3
2	Remote Sensing and GIS in Civil Engineering	3	1	3	2	Construction Personnel Management, Quality Control and Safety Management	3	1	3
3	Urban Hydrology, Storm Drainage and Management	3	1	3	3	Construction Planning, Scheduling and Management	3	1	3
4	Geotechniques for Infrastructre	3	1	3	4	Environmetal Impact Assessment	3	1	3
5	Urban Transport Alternatives	3	1	3	5	Construction Methods and Equipment	3	1	3
6	Elective – I	3	1	3	6	Elective II	3	1	3
7	GIS Lab	-	4	2	7	Construction Software Lab-II	--	4	2
<b>Total</b>		<b>18</b>	<b>10</b>	<b>20</b>	<b>Total</b>		<b>18</b>	<b>10</b>	<b>20</b>

**Note : Each semester should have 80 instructional days (equivalent to 16 working weeks ) followed by 7 working days for examination.**

#### Elective – I

E1 – Sea and Inland Port Infrastructure  
 E2 - Structures for Power Plants  
 E3 – Building Management Systems

#### Elective - II

E4 – Irrigation Water Distribution Sstems  
 E5 – Airport Planning and Design  
 E6 - Contracts and Arbitration

## (SECOND YEAR)

I – Semester					II – Semester				
S.No	Name of the subject	L	T/P	Cr	S.No	Name of the subject	L	T/P	Cr
1	Industrial Training	-	-	5	1	Project – Work	-	-	5
2	Report on Training	-	-	2	2	Viva-Voce in Project work	-	-	5
3	Seminar on Training undergone	-	-	3					
<p><b>Note :</b> A student has to undergo practical training in any of the reputed construction company/ organisation, approved by the Department for a period of 16 weeks. After the training he/ she should submit a port (based on the training undergone) to the department. The student should also give a seminar on the same.</p>					<p><b>Note :</b> During this semester a student is expected to work on a topic related to the area of his/ her specialization for his project work under the supervision of the faculty. At the end of the project work, he/ she should submit a thesis/ report on the topic chosen for project work and face a Viva-Voce examination.</p>				

# SYLLABUS

## FIRST YEAR, FIRST SEMESTER

### INDUSTRIAL STRUCTURES

**Introduction:** Planning and layout of industrial buildings, modular co-ordination and standardization, large space column-free structural system, precast, refabrication of construction components, transportation, erection –recent advantages.

System stability and performance –force –gravity, wind and earthquake – force flow – stability check.

**Industrial Structural System :** Portals Steel types – single bay – Multi-bay – rectangular and curvilinear shapes – RSJ and cold formed building sections – tubular (circular, rectangular, square hollow sections). Concrete – Portals – Insitu and precast arches – A-frame –rectangular and barrelvault.

**Geodesic surfaces :** Fullers dome –section of forms modules, elements – assembly and action.

Cable Stayed Structures : Freely suspended – prestressed and special tension system.

Floors : Grids – single and double layer grid virendeel deck – flat slabs – lift slabs – deck slabs.

Roofing : Shell – plates – folded plates – skins – membranes.

**Materials, Plant cast and Precast Products :** Concrete – Steel – light gauge metal – aluminum –rigid – corrugated roofing, cladding and false ceiling – plastic – PVC – poly carbide – fiber glass – acrylic – anodized aluminum and other special current materials and products – precast funicular and hyper sheet element and ferrocement plates for floors, roofs and geodesic surfaces.

**Joints :** Classification of joints – design and construction of joints – detailing of construction joints – efficiency of joints – efficiency of joints under static and dynamic loads.

### Reference Books

1. Frelotto, Editor – Tensile structures, Pneumatic Structures, Cable structures, Vol. I & II, MIT Press, London.
2. Murashev, V.Sigalov. E., Bilove,V., “Design of RC Structures, MIR Publishers, 1968.
3. Lassle Makk, Prefabricated concrete for industrial and public structures, Akadema Kiado, Budapest, 1964.
4. CBRI, Building materials and components, India, 1964.
5. Structural Design Manual, Precast concrete connection details, society of studies in use of precast concrete, Netherland, Bector, Verlag, 1978.
6. Koncz T., Manual of Precast Concrete Constructions, Vol. II & III, Bauverlag GMBH, 1971.

## **REMOTE SENSING AND GIS IN CIVIL ENGINEERING**

**Fundamentals of Remote Sensing :** Definition, physics of Remote Sensing, Electromagnetic radiation and its interactions with Atmosphere, Spectral reflectance of earth objects.

**Data Acquisition :** Various platforms, Aerial photography, Satellite sensors – Optical, Thermal and Microwave, Different type of data products and their characteristics, Satellite data – acquisition, storage and retrieval.

**Data Analysis :** Visual interpretation, Digital Image processing – principles, correction, pre-classification processing, classification techniques.

**GIS :** Introduction to GIS – concepts, different modules – decision making – exposure to various GIS softwares.

**Remote Sensing and GIS Applications :** Conservation and management of natural resources – Landuse/landcover mapping – soil and landform studies – Agricultural use – Forestry studies – Air Pollution – EIA –Wasteland management – site selection studies – Detection and identification of pollution sources of surface and ground water – water quality mapping and monitoring – Flood control – Urban and Coastal Zone Management.

### **Reference Books**

1. Lillesand T.M. and Kiefer R.W. “Remote Sensing and Image Interpretation”, John Wiley and Sons, 1987.
2. Lintz J. and Simonett, “Remote Sensing of Environment”, Addison Wesley Publishing company, 1984.
3. Paul Curran P.J. “Principles of Remote Sensing”, ELBS, 1983.
4. Burrough, P.A. “Principles of GIS for land resources Assessment”, Oxford Publication. 1980.

## **URBAN HYDROLOGY, STORM DRAINAGE AND MANAGEMENT**

**Urban Hydrological Process :** Urban Eco-system Concept – Water in the Urban Eco-System – Urban Water Sub-system – Urban Hydrology – Urban Hydrological cycle.

**Urban Storm Water Drainage :** Basic Concepts of Stormwater Management – Urban Drainage Modelling Methods – Selection of Storm depth – Statistical generation of Storm Durations and Depths – Generation of Hydrographs – Urban Storm Water Runoff Models.

**Urban Storm Water Management :** Hydraulic Analysis and Design Guidelines – Flow capacity of an Urban street – Storage capacity of an Urban Street – Storage capacity of an Urban

Street – Detention and Retention Outlet control structures – Planning and Design – Detention / Retention facilities – Structural and non-structural Management.

**Urban Storm Water Operation and Maintenance :** General Approaches to Operations and Maintenance, Complexity of Operations and need for Diagnostic Analysis – Operations and Maintenance in Urban Water Systems – Maintenance Management Systems – Inventories and Condition Assessments – Social awareness and involvement.

### **Reference Books**

1. Neil, S. Grigg., “Urban Water Infrastructure Planning, Management and Operations”, John Wiley & Sons, 1986.
2. D. Stephenson, “Stormwater Hydrology and Drainage” Elsevier Publications, 1981.
3. H. Hengeveld and C. Devocht (Ed.) “Role of Water in Urban Ecology”, 1982.
4. Overtens D.E. and Meadows, M.E., “Storm Water Modelling”, Academic Press, New York, 1976.
5. Viesshan-Wi, Knapp J.W., and Lewis, G.L., and Henbrough, T.E., Harper and Row, New York, “Introduction to Hydrology”, 1977.

### **GEOTECHNIQUES FOR INFRASTRUCTURE**

Types of foundations for industrial structures; Design of deep foundations for heavy structures and railway and highway bridges; foundations for transmission line towers; storage tanks, silos, chimneys etc., site investigation for infrastructure projects; excavation scheme; Sheet piles and cofferdams; Design of dewatering systems; Construction equipments.

### **Reference Books**

1. “Analysis and Design of Substructures” by Swami Saran.
2. “Basic and Applied Soil Mechanics” by Gopal Rajan and A.S.Rao.
3. “Soil Mechanics and Foundation Engineering – Foundation Engineering – II” by V.N.S. Murthy.
4. “Foundation Analysis and Design “ by J.E. Bowels.

## URBAN TRANSPORTATION ALTERNATIVES

**Transport Planning Process :** Systems approach to transport planning- Land use transport interaction – Survey and analysis of existing conditions – Forecast analysis of future conditions and plan synthesis – Transportation surveys analysis and application.

**Stages in Transport Planning :** Trip generation – theory and modelling techniques – Trip distribution – theory and modelling techniques and methodologies – Trip assignment – theory and modelling techniques and methodologies – Modal split- theory and analytical techniques.

**Land use Transport Models :** Selection of land use transport models – Systems dynamics principles and application – Model building techniques and validation – Transport modes, technology and selection.

**Transport Economics and Environment :** Economic evaluation of transport plans – Vehicle operating costs – Value of travel time savings and accident costs – Fuel crisis and promotion of public transport. Severance and land consumption – Environmental areas – Air and noise pollution standards and abatement techniques.

**Transport Systems :** Planning and design issues of various transport systems – Bus, Train, Tram, LRT, Waterways – Capacity and space utilisation – Containers in transportation – Integrated planning of various transport systems.

### Reference Books

1. David Hensher and others (Eds), Proceedings of Seventh World Conference on Transport Research : Volume 1 – Travel Behaviour, Volume 2 – Modelling Transport Systems, Volume 3 – Transport Policy, Volume 4 – Transport Management, Pergamon Press, USA, 1996.
2. John W. Dickey, Metropolitan Transportation Planning, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1980.
3. Michael D. Meyer and Eric J. Miller, Urban Transportation Planning : A Decision Oriented Approach, McGraw-Hill Book Company, New York, 1984.
4. Thirumurthy A.M., Environmental Facilities and Urban Development in India –A System Dynamic Model for Developing Countries, Academic Foundations, India, 1992.

## ELECTIVE - 1

### E1. SEA AND INLAND PORT INFRASTRUCTURE

**Introduction:** Ports and harbours as the interface between the water and land infrastructure – an infrastructure layer between two transport media.

**The fundamentals:** Wave conditions inside harbour; water circulation; breakwaters, jetties & quay walls; mooring, berthing and ship motion inside the port; cargo handling – bulk material storage & handling.

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

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

**Inland Waterways and ports:** maintenance of waterways, construction of environmentally engineered banks, dredging, processing and storing of polluted dredged materials, development of river information services, planning, design and construction of inland port infrastructure, renovation of inland port infrastructure.

**Sustainability:** Global trade and port restructuring/reforms, impact of possible climate change scenarios, sustainable development strategies for cities and ports.

#### Reference Books

1. “Coastal Hydraulics Sea and Inland Port Structures” by A.M. Muir Wood and C.A. Fleming. Hall stead press.
2. “Dock and Harbour Engineering” by H.P. Ozha and G.H. Ozha, Charoter Book stad Anand.
3. “ Dock and Harbour Engineering” by S. Seetharamam, Umesh Publications.
4. “Coastal Engineering Volume I & II by Richand L. Silister – Elsevier Scientific Publishing Company.
5. Pera Brunn, “Port Engineering”, Gulf Publishing Company.

## **E 2. STRUCTURES FOR POWER PLANTS**

Planning, Analysis and Design of different types of power plants – Chimneys, Induced draught and Natural draught cooling towers, Turbogenerator Foundation, Material handling structures, intake towers, storage structures and other supporting structures for equipments.

### **Reference Books**

1. Hand book of Machine Foundation by P.Srinivasan, C.V.Vaidyanathan.
2. Design of Machine Foundations by Vijayakepani, Sharmshare Prasad.
3. Advanced Reinforced Concrete Design by N.Krishna Raju.
4. The Industrial Cooling Tower with special reference to design, construction, operation and maintenance of water cooling tower by Mc. K. Eldey, K.K and Naxey Brooke, Elsiver Publishing company.

## **E3. BUILDING MANAGEMENT SYSTEMS**

Concept and application of automation and management system; design issues related to Concept and application of automation and its effect on functional efficiency; competency;

Components of building automation system; HVAC, electrical lighting, security, fire-fighting, communication etc., integrated approach in design, maintenance and management system; current trend and innovation in building automation systems;

Impact of information technology; concept of artificial intelligence; knowledge base and decision support systems and building automation and management system; application of expert system in building automation; stages in development of expert system, expert system application, architecture computerizing building management information.

### **Reference Books**

1. Energy economics and building design – Willan T. Mayer.
2. Designing for Fire safety by E.C. Butcher and A.C. Parnell.
3. Building Services by Peter R. Smith and Warden G. Julian.

## **GIS LABORATORY**

### **Experiments**

1. Digitization of points and lines.
2. Editing of Map elements.
3. Attribute Data entry and Manipulation.
4. Cleaning, building, and transformation.
5. Data Analysis – Reclass, overlay, buffer.
6. Map Generation with patterns, legends.
7. DEM Generation and Drapping of Image.
8. Modelling with attribute data.
9. Network Analysis.

### **Software**

1. Arc GIS 9.0
  2. ERDAS 8.7
  3. Mapinfo 6.5
- Any one or Equivalent

### **Text Books**

1. Concept and Techniques of GIS by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

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## **FIRST YEAR, SECOND SEMESTER**

### **CONSTRUCTION ECONOMICS & FINANCE MANAGEMENT AND CONTROL**

Construction economics topics – time value of money, cash flow, depreciation, taxes, inflation, sources of funding, rate of return, evaluation of alternatives, cost-benefit analysis, replacement analysis; Infrastructure financing; Life-cycle costing, Construction accounting; Construction

Cost Control; Personnel costs; Equipment costs; Job indirects and mark up, Approximate estimates; Construction Finance; Computer applications.

### **Reference Books**

1. “Construction Management and Planning” by B. Sengupta and H.Guha (TMH).
2. “Construction Management” by Atkinson (Elsevier).
3. “Managerial Economics”, by Varshney R.L. and Maheswari, K.L, Sultan chand.
4. “Financial Management and Policy” by James C.Van Harne, Prentice Hall of India Pvt., Ltd., New Delhi (1979).
5. “The Managerial Decision Making Process”, by Houghton Mifflin Co., Boston (1975).

## **CONSTRUCTION PERSONNEL MANAGEMENT, QUALITY CONTROL AND SAFETY MANAGEMENT**

**Quality:** Traditional approaches, its importance in technology driven, competitive market economy, new approaches and recent developments.

**Quality Control, Quality Assurance, Quality Management and total Quality management (TQM):** Meaning, scope and relationship of the concepts, the need of a continuum.

**Quality Standards in Construction:** Standards for various building materials and other inputs for construction processes, methods and techniques for construction outputs, products and services.

Indian standards, British, American, German & Japanese standards; study comparisons and equivalence.

**Managing Quality in Construction:** Building quality into designs of structures, inspection of incoming materials and machinery, in-process quality inspections and tests.  
Designing of quality manuals, checklists and inspection reports, installing the quality assurance system, monitoring and control.

Quality Assurance Department and quality control responsibilities of the line organization.  
Quality in foundations and piling work, structural work, concreting, electrical system, buildings facilities, waste recycling and maintenance.

**Developing quality culture in the organization:** Training of people, Manualisation of operations, benchmarking quality, Synergy, Quality circles. ISO 9000, ISO 14000 & QS 9000 standards and certification procedures.

## **Reference Books**

1. Josy J. Farrilaro “ Hand Book of Human Resources Administration” McGraw-Hill (International Edition), 1987.
2. R.S. Dwivedi, “Human Relations and Organisational Behaviour”, (BH –1987).
3. Dr. C.B. Manoria, “Personnel Management”, Himalaya Publishing House, 1992.
4. Corlecton Coulter, Jill Justice Coulter ”The Complete Standard Hank Book of Construction Management”, Prentice – Hall, 1989.
5. Juran Frank, J.M. and Gryna, F.M. “Quality Planning and Analysis:., Tata McGraw Hill, 1982.
6. Grant E.L. and Leavensworth, “Satisfical quality Control”, McGraw Hill, 1984.
7. Kwaku, A, Tenah/Jose, M. Guevara, “Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc, Virginia, 1985.
8. James, J.O. Brien, “Construction Inspection Hand Book – Quality Assurance and Quality Control”, Var Nostrand, New York, 1989.
9. Drummond Helga, “The TWM Movement”, UBSPD Bombay, 1994.
10. Hutchins G, “ISO 9000” Visa Books, New Delhi, 1993.

## **CONSTRUCTION PLANNING, SCHEDULING AND MANAGEMENT**

### **Unit-1 :**

Introduction to project planning, scheduling –methods of scheduling – bar chart – mile stone chart – controlling. Job layout work break down structure –LOB technique. Network techniques in construction management – terms and definitions. Events – activities –dummies – types of networks –creating network schedule – rules –advantages of net works.

### **Unit-II :**

PERT and CPM net works – application to construction problems.

### **UNIT-III :**

Precedence networks – advantages – Logic or precedence networks – applications. Decision networks and GERT networks – applications and advantages of GERT networks.

### **UNIT IV :**

Direct cost, indirect cost and total cost. Optimization of cost through network contraction – Linear programming methods for cost optimization : Critical path using L.P. project cost formulation – non-linear cost time trade – off.

## **UNIT V :**

Cost control in construction – importance of cost control and its objectives – Resources analysis, smoothing and scheduling. Project updating – methods of updating.

### **Reference Books**

1. Moder J.J. Philips, C.R. and Davis, E.W. “Project Management with CPM and PERT, and precedence diagramming”, C.B.S. publishers and distributors, New Delhi, 1986.
2. Pilcher, R. “Project Cost Control in Construction”, Collins, London, 1992.
3. Brien J.J. CPM in “Construction Management”, Mc. Graw Hill Book Company, Inc. NY, 1971.
4. S.Seeetharaman, “Construction Engineering and Management”, (4<sup>th</sup> Edition) Umesh publications, New Delhi.

## **ENVIRONMENTAL IMPACT ASSESSMENT**

Evolution of EIA; Concepts of EIA, EIA methodologies, Screening and scoping, Rapid EIA and Comprehensive EIA, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk, analysis, Definition of Risk, Matrix method. Checklist method, Fault free analysis, Consequence Analysis, Socioeconomic aspects, measure of effectiveness of pollution control activities, Environmental Legislation, Introduction to Environmental management Systems, Environmental Statement-procedures, Environmental Audit: Cost Benefit Analysis Life Cycle Assessment, Resource Balance, energy balance & Management Review, Operational Control, Case studies on EIA.

### **Reference Books**

1. “Environmental Impact Assessment Methodologies”, by Y.Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. “Environmental Science and Engineering”, by J.Glynn and Gary W. Hein Ke-Prentice Hall Publishers.
3. “Environmental Science and Engineering”, by Suresh K Dhaneja – S.K. Katania & Sons Publications, New Delhi.
4. “Environmental Pollution and Control”, by Dr. H.S. Bhatia –Galgotia Publication (P) Ltd., Delhi.

## CONSTRUCTION METHODS AND EQUIPMENT

### **Unit –I : Methods and Techniques for Construction**

**Substructure :** Digging and excavation of trenches – Grading – Special earth work excavation – Drilling and blasting techniques. Pile driving techniques – sinking wells.

**Superstructure :** Concrete and reinforced concrete works – forms work – reinforcement – concreting – mechanized methods of erection of Buildings and installations. Cast-in-situ and pre-cast concrete. Concreting below G.L. – wall in situ method for cast in situ and precast concrete – under water concreting design of forms.

**Unit-II :** Erection of construction units – different types – scaffolding . Erection of steel structures – Tunneling techniques. Pre cast and prefabricated construction – need and advantages. Modular co-ordination – I.S. recommendations for modular planning, standardization, mass production and methods of transportation.

**Unit – III :** Construction Equipment and Machinery - Earthmoving Equipment : Power shovels, Back hoe, Dragline, Clam shell; Tunneling machine – types.

**Excavating Equipment :** Scraper, Bulldozer.

**Compacting Equipment :** Smooth wheel roller sheep-foot roller – Pneumatic typed rollers.

**Construction Equipment:** Hoisting equipment – such as hoist winch, hoisting chains, and hooks and slings, various types of cranes –tower crane, mobile crane and derrick crane. Their characteristics, performance and safety in operation.

**Unit – IV :** Hauling Equipment : Dump trucks and dumpers.

**Conveying Equipment :** Belt Conveyors, Screw conveyor, Bucket conveyor.

**Agreement and Concrete production equipment :** Concrete mixers, truck mixers, pneumatic concrete placer, concrete vibrators.

**Pile Driving Equipment :** Tunneling and rock drilling equipment – Pumps and dewatering equipment.

### **Unit-V: Management of Construction Equipment**

Time and motion study – process charts – application of queuing or waitline models management of construction equipment – need for mechanization of construction – planning and financing construction plant and equipment – Owning and operating equipment versus hiring – planning for infrastructure mechanization OR in equipment management – equipment maintenance and repair.

### **Reference Books**

1. Mahesh Varma (1997) “Construction Equipment and its Planning and Applications” Metropolitan Book Co.(P) Ltd., New Delhi. India.

2. B. Sengupta and H. Guha : “Construction Management and Planning “ (TMH Publication)
3. S. Seetharamam, “Construction Engineering and Management” (Umesh Publications, Delhi.
4. Rangwala “Construction of Structures and Management of Works” (Charotar publishers)
5. U.K. Srivatsava (1999) “Construction Planning and Management “Galgotia Publications Pvt. Ltd., New Delhi, India.
6. Peurify, R.L. (1996) “Construction Planning, Equipment and Methods”.
7. “Construction Machinery and Equipment in India”. (A compilation of articles Published in Civil Engineering and Construction Review) Published by Civil Engineering and Construction Review, New Delhi, 1991.
8. Jay P.K. “Hand Book of Construction Management” – Mamillan India Ltd., New Delhi, 1990.
9. National Building Code, ISI, New Delhi, 1983.
10. Levitt, R.E. and Samelson, N.M. “Construction Safety Management”, Mc. Graw Hill Book Company, Inc., N.Y. 1991.
11. Adrian J.J. “Construction Productivity Improvement”, Elsevier, New York, 1987.
12. P.S. Ghalot and B.M. Dhir, “Construction Management”, (Wiley-Easter).

## **Elective –II**

### **E.4 IRRIGATION WATER DISTRIBUTION SYSTEMS**

**Introduction :** Irrigation development in India – type of irrigation system – method of distribution – RWS, Warabandi, Shejpati and localisation.

**Distribution works :** Types of Head works – Classification of Channels – Regulations – Drops Canal escapes – Sluices – Sand vent – Tail dams – Syphons.

**Canal :** Design of erodible – non-erodible channels – division box – diversion box – outlet – proportional diviers – bed dam – block / chak design – commandability – realignment of block – operation and maintanance.

**Closed Conduit Distribution :** Drip – Sprinkler – Underground pipe design – Layout – Evaluation – Operation and Maintenance.

**Flow Measurements :** Flow measuring structures – Flumes Weirs – Orifices – Dilution Techniques – Channel transitions – Canal losses – Measurement of losses.

### **Reference Books**

1. R.S. Varshney, S.C.Gupta and R.L. Gupta, “Theory and Design of Irrigation Structures”, Nemchand & Brothers, Roorkee, 1992.
2. A.M. Michael, “Irrigation Theory and Practice”, Vikas Publishing House Pvt. Ltd., 1995.
3. R.K. Sharma, “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 1984.
4. H.W. Ellis, “College of Engineering Irrigation Manual”, Government of Tamil Nadu, 1973.
5. “Irrigation Systems Design (An Engineering Approach) by Richard H. Cuneca, Prentice Hall Inc. (1989).

## **E.5 AIRPORT PLANNING AND DESIGN**

Air transportation; Classification and size of airports; Aircraft characteristics; Air traffic control; Airport location and necessary surveys; planning, layout and design of runways, taxiways and aprons; Terminal service facilities – passenger, baggage and cargo handling systems; Lighting, visual aids, airport drainage, Operations and scheduling; Ground transportation facilities, Airport capacity and delays.

### **Text Book**

1. S.K. Khanna, M.G. Arora – S.S. Jain “Air port Planning and Design” (6<sup>th</sup> Edition) New Chand & Brothers, Roorkee (UP)

### **Reference Books**

1. V.P. Priyani “Highway and Airport Engineering”, Charokar Publishing house, Anand.
2. S.C.Rangwala and P.S.Rangwala, “Airport Engineering, Charokar Publishing house, Anand.

## **E6. CONTRACTS AND ARBITRATION**

1. **Construction Specifications** : Standard specifications, development interpretation.
2. **Contracts and Management of contracts** : Engineering contracts and its formulation – Definition and essentials of a contract – types of contracts and clauses for contracts –

Preparation of tender documents – Issues related to tendering process –Awarding contract.

**Performance of contracts** – Discharge of a contract – Classification of contracts – Indian Contract Act 1872 – Extracts and variations in Engineering contracts – Time of performance – provisions of contract law – Breach of contract.  
Contracts for projects under International AID.

3. **Laws related to construction Industry** : Labour and Industrial laws – payment of wages act, contract labour – workmen’s compensation act – Insurance, Industrial dispute act.
4. **Arbitration of Engineering contracts** – Indian Arbitration Act 1940 – Issues in arbitration process – Institutional arbitration – Alternate dispute resolution – The arbitration and reconciliation ordinance 1996 – Law on contracts 1994.

### **Reference Books**

1. “Codes of Practice and Standard Specifications” of AP PWD, CP WD, MES etc.,
2. “Engineering Contracts and Arbitration”, by B.J. Vasavada (March 1996).
3. “Laws relating to Building and Engineer’s Contracts” by G.T. Gajaria – M.M. Tripathi Pvt. Ltd., Mumbai, 1985.
4. “Professional Practice” by Roshan Namavat”, published by Anupbhai Publications, Lakshmi Book Depot, Ramachandra Buildings, 437, New Charani Road, Mumbai.
5. M.O’c Horgon and F.R. Roulstion “ Project Control of Engineering contracts E and FN, SPON, Ny, 1988.
6. K. Collex, “Managing Construction Contracts”, Reston publishing Company, Virginia, 1982.
7. W.B. Park “Construction Bidding for Projects”, John Wiley, Ny, 1978.
8. "Latest Amenedments to latest versions of Building Bye-Laws and Engineering Contract Laws”.

## **PROJECT MANAGEMENT LAB**

### **Experiments**

1. Creation, saving, opening layouts.
2. Working with activities.
3. Defining relationships – Editing and selecting relationships.
4. Calculating a schedule, usage of date and float constraints.

5. Defining resource calendars.
6. Breaking down project components.
7. Defining custom data items.
8. Planning resources and costs.
9. Resource leveling.

### **Reference Books**

1. Project Management using Primavera – Eastwood Harris Publications.
2. M.S. Project – Microsoft Press.