

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institute)
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATION [LR-21]
(W.e.f Academic Year 2024– 25)
B.E. VII-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			Credits
				L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U21CE701	PCC	Estimation Costing and Specifications	3	0	0	3	40	60	3	3
2	U21CE702	PCC	Pre-stressed Concrete	3	0	0	3	40	60	3	3
3	U21CE703	PCC	Foundation Engineering	3	0	0	3	40	60	3	3
4	U21CE704	PCC	Design of Steel Structures	3	0	0	3	40	60	3	3
5	-	PEC	Professional Elective-III	3	0	0	3	40	60	3	3
6	-	OEC	Open Elective – III	3	0	0	3	40	60	3	3
Project											
7	U21CE7P1	PROJ	Mini Project	0	0	6	6	50	50	0	3
Skill Development Course											
8	U21CE7L1	ESC	Computer Applications Lab	0	0	2	2	25	50	3	1
Total				18	0	08	26	340	410	-	22.0

L: Lecture (Hrs/Wk/Sem)

T: Tutorial (Hrs/Wk/Sem)

P: Practical

D: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation

SEE: Semester End Examination (Univ. Exam)

PEC: Professional Elective Courses

PCC: Program Core Courses

OEC: Open Elective Courses

PROJ: Project

ESC: Engineering Science Courses

CE: Civil Engineering

Note:

1. Each contact hour is a Clock Hour.

2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

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SCHEME OF INSTRUCTION & EXAMINATION [LR-21]
Professional Elective Courses

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			Credits
				L	T	P/ D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U21CE506	PEC 1	Building Construction Practice	3	-	-	3	40	60	3	3
	U21CE507		Advanced Surveying	3	-	-	3	40	60	3	3
	U21CE508		Air and Noise Pollution Control	3	-	-	3	40	60	3	3
	U21CE509		Urban Transportation Planning	3	-	-	3	40	60	3	3
2	U21CE604	PEC 2	Construction Project and Planning	3	-	-	3	40	60	3	3
	U21CE605		Sustainable Construction Methods	3	-	-	3	40	60	3	3
	U21CE606		Solid and Hazardous Waste Management	3	-	-	3	40	60	3	3
	U21CE607		Public Transportation Systems	3	-	-	3	40	60	3	3
3	U21CE705	PEC 3	Contracts Management	3	-	-	3	40	60	3	3
	U21CE706		Advanced Concrete Technology	3	-	-	3	40	60	3	3
	U21CE707		Advanced RCC Design	3	-	-	3	40	60	3	3
	U21CE708		Traffic Engineering and Management	3	-	-	3	40	60	3	3
4	U21CE802	PEC 4	Ground Improvement Techniques	3	-	-	3	40	60	3	3
	U21CE803		Repair and Rehabilitation of Structures	3	-	-	3	40	60	3	3
	U21CE804		Environmental Impact Assessment	3	-	-	3	40	60	3	3
	U21CE805		Intelligent Transport Systems	3	-	-	3	40	60	3	3
5	U21CE902	PEC 5	Surface Hydrology	3	-	-	3	40	60	3	3
	U21CE903		Finite Elements Methods	3	-	-	3	40	60	3	3
	U21CE904		GIS and Remote Sensing	3	-	-	3	40	60	3	3
	U21CE905		Infrastructure Engineering	3	-	-	3	40	60	3	3

Professional Electives with 5 Threads

S.No.	PE 1	PE 2	PE 3	PE 4	PE 5
1.	Building Construction Practice	Construction Project and Planning	Contracts Management	Ground Improvement Techniques	Surface Hydrology
2.	Advanced Surveying	Sustainable Construction Methods	Advanced Concrete Technology	Repair and Rehabilitation of Structures	Finite Elements Methods
3.	Air and Noise Pollution Control	Solid and Hazardous Waste Management	Advanced RCC Design	Environmental Impact Assessment	GIS and RemoteSensing
4.	Urban Transportation Planning	Public Transportation Systems	Traffic Engineering and Management	Intelligent Transport Systems	Infrastructure Engineering

S. No.	Course Code	Category	Course Title
3	U21EE711	OEC 3	Introduction to Electrical Vehicles
	U21EE712		Design estimation and Costing of Electrical Systems
	U21CS711		Data Sciences
	U21IT705		Basics of Artificial Intelligence
	U21ME711		Renewable Energy Resources
	U21ME712		Cooling of Electronic Components
	U21CE711		Environmental Systems**
	U21CE712		Urban Transportation System**
	U21EC703		IOT and its protocols
	U21EC704		Television and Video Engineering
	U21MB702		Logistics Management
	U21MB703		Management of Start Up's
	U21SH701		Display Devices
	U21SH702		Comparative Study of Literature

S. No.	Course Code	Category	Course Title
4	U21EE804	OEC 4	Smart Building Systems
	U21EE805		Industrial Automation
	U21CS806		Basics of Machine Learning
	U21IT802		Cloud computing
	U21ME806		Automobile Engineering
	U21ME807		Power Plant Engineering
	U21CE806		Green Building Technology**
	U21CE807		Environmental Impact Assessment**
	U21EC805		Fundamentals of Wireless Communication
	U21EC806		Fundamental Digital Design using Verilog HDL
	U21MB802		Entrepreneurship
	U21MB803		E - Marketing
	U21SH801		Corrosion Science and Technology
	U21SH802		Introduction To Philosophical Thoughts

*Open Elective subjects not offered to the students of Civil Department.

Course Code	Course Title					Core / Elective	
U21CE701	ESTIMATION COSTING AND SPECIFICATION					Core	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
---	3	-	-	3	40	60	3
<p>Course Objectives The objectives of this course is to:</p> <ol style="list-style-type: none"> 1. Acquire knowledge on specifications and detailed estimation of building used in construction 2. To equip the students with current practices in detailed estimation of roads, culvert and canals. 3. To learn the estimation of reinforcement quantities. 4. Learn to prepare rate analysis for various items of works in construction 5. Evaluate the actual value of land and buildings <p>Course Outcomes After Completion of this course, the student will be able to</p> <ol style="list-style-type: none"> 1. Estimate the quantities of materials prepare a detailed estimate for different types of structures. 2. Prepare a detailed estimate for roads, culvert and canals. 3. Compute and prepare bar bending schedules. 4. Prepare rate analysis for various quantities 5. Assess the value of land and buildings 							

UNIT – I

Specification: Definition, purpose and importance of specifications, Types of specification, general rules for the measurements and its units of different items of civil engineering work.

Detailed Estimation of Buildings: Types of estimates, various methods of approximate estimate of buildings, Detailed estimate for Flat roof building (load bearing and RCC framed) - long and short wall method - centre line method.

UNIT – II

Detailed Estimation of Roads, Culvert and Canals: Detailed estimate of road works for WBM roads, Bituminous and CC road (including earth work), single cell rectangular box culvert and earth work of irrigation canals (cutting and banking).

UNIT – III

Estimation of Reinforcement Quantities: Estimation of steel quantities and preparation of bar bending schedule (BBS) - RCC framed works for Slabs, Beams and Columns, Footings (Rectangular, Isolated), Stair Case, Overhead rectangular tank and Retaining wall.

UNIT – IV

Rate analysis of civil work: Preparation of analysis of rates and theoretical requirements of materials as per the Telangana State Standard Data and Schedule of Rates, for major items of works of buildings, bituminous and concrete roads.

UNIT – V

Valuation of Buildings: Introduction, Basic elements - Market Value, Book Value, Salvage Value, Replacement Cost, Earning Value, Potential Value, Written Down Value, Different Methods of Valuation - Land and Building Method - Land tenure - Freehold Land and Leasehold Land, Land Valuation, Replacement Cost of Building, Depreciation, Value as per Land and Building Method.

Text Books:

1. Dutta, B.N. Estimating and Costing in Civil Engineering Theory and Practice. UBS Publishers' Distributors Pvt. Ltd., New Delhi. (2016).
2. Chakraborti, M. Estimating, Costing and Specifications in Civil Engineering. Chakraborti, Kolkata. (2002).
3. Jagjit Singh. Estimating and Costing in Civil Engineering. Galgotia Publications, New Delhi, (1996).
4. B. S. Patil, Civil Engineering Contracts and Estimation, Orient Black swan Private Ltd; Fourth edition 2015.

References:

1. Gurcharan singh & Jagdish singh, —Estimating Costing and Valuation, Standard Publishers Distributors, 2012.
2. Kohli D.D. and Kohli R.C., A Text Book of Estimating and Costing (Civil) S. Chand & Company, Limited, New Delhi, 2012.
3. Standard Scheduled Rates and Relevant BIS Codes (SP:27 & BIS: 1200)
4. Rangwala S.C., Elements of Estimating and Costing in Civil Engineering, Charotar Publishing House, India, Gujarat,

2011.

5. Rangwala S.C., “Valuations of Real Properties”

6. Banerjee D.N., “Principles and Practices of Valuation”, Eastern Law House, V Edition, 1998.

7. Vazirani, V.N. and Chandola S.P., “Estimating and Costing”, Khanna Publishers, New Delhi.

Course Code	Course Title				Core / Elective		
U21CE702	Prestressed Concrete				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DRCS	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. The aim of this course is to introduce students to the basic principles about structural behaviour, of pre stressed concrete structures, with reference to IS 1343 code
2. The objective is to equip the students with a thorough understanding of the behaviour and analysis, design of prestressed concrete beam, slab and column.
3. Various time dependent factors, such as cracking, creep and shrinkage of concrete, and prestress losses, are discussed thoroughly.
4. Background to design equations and relevant modern research will also be discussed to provide the students with solid understanding of the topics covered.
5. To provide students with an opportunity to enhance their skills in pre stressed concrete design and applications. The specific implication, to the serviceability and ultimate limit states are covered.

Course Outcomes

After Completion of this course, the student will be able to

1. Apply the concept of prestressing and determine the losses of prestress.
2. Analyze the prestressed concrete beam and suggest the cable profile for beam.
3. Analyze the prestressed continuous beam and determine the concordant cable profile.
4. Design the prestressed concrete beam for flexure and shear.
5. Estimate the deflection of a prestressed concrete beam and design the end block.

UNIT – I

Introduction to Prestressed Concrete: Introduction to Prestressed Concrete: Materials - High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing.

Losses in Pre stress: Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip, Creep of concrete, Shrinkage of concrete and Relaxation of steel - Total Loss.

UNIT – II

Analysis of Prestress: Basic assumptions, analysis of prestress, resultant stress, pressure line, kern points, cable profiles, load balancing concept, stress diagrams for prestress, dead load and live load.

UNIT – III

Simply Supported Continuous Beams: Advantages of continuous member – codal provisions, concordant cable profile, analysis of continuous prestressed concrete beams.

Design of Section for Flexure: Analysis of members at ultimate strength: design of rectangular section using IS 1343 Codal Provisions

UNIT – IV

Design of Section for Shear: Analysis for shear - Components of shear resistance - Modes of Failure- Limit State of collapse for shear - Design of transverse reinforcement.IS 1343 Codal Provisions.

End Block: Different anchorage system and design of end block by latest IS codes

UNIT – V

Deflections: Importance of deflections, factors influencing deflections, codal provisions – short-term and long-term deflections of pre-stressed concrete beams with uniformly distributed and point loads.

Text Books:

1. Krishna Raju, N. “Pre stressed Concrete”, Tata McGraw Hill Publishing Company, New Delhi 2006
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications
3. Rajagopalan N, “Pre - stressed Concrete”, Narosa Publishing House, New Delhi
4. J.R. Libby, Modern prestressed concrete, CBS Publishers, 2007.

References:

1. Praveen Nagarajan, “Advanced Concrete Design”, Person Publishers
2. P. Dayaratnam, “Pre stressed Concrete Structures”, Scientific International Pvt. Ltd.
3. Lin T Y and Burns N H, ‘Design of Pre - stressed Concrete Structures’ , John Wiley and Sons, New York
4. Pundit G S and Gupta S P, “Pre - stressed Concrete”, C B S Publishers, New Delhi
5. IS: 1343: Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.
6. Krishna Raju. N., “Pre-stressed Concrete - Problems and Solutions”, CBS Publishers and Distributors, Pvt. Ltd., New Delhi.
7. H. Arthur, Nilson, Design of prestressed concrete, Wiley India Pvt.ltd, 2011.

Course Code	Course Title					Core / Elective	
U21CE703	FOUNDATION ENGINEERING					Core	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Soil mechanics	3	0	0	3	40	60	3

Course Objectives

The objectives of this course is to:

1. Learn the definition, necessity, types and suitability of different foundation systems.
2. Understand the procedures of geotechnical design of foundations.
3. Understand the necessity and usage of different foundation construction related aspects.
4. Learn about different methods of geotechnical investigations and its role in selection and
5. Design of foundations

Course Outcomes

After completion of this course students will be able to

1. Evaluate the bearing capacity of soil and allowable settlement.
2. Analyse the stability of finite and infinite slopes using various methods
3. Examine the earth pressure theories and stability of retaining walls.
4. Analyse the capacity and settlement of shallow foundation.
5. Analyse the capacity and settlement of pile foundation.

UNIT – I

Soil Exploration: Soil exploration, objectives, depth of exploration, significant depth, methods of exploration, various methods of exploration, test pits, types of samples, types of samplers, design of samplers, borings, various methods of boring, geophysical methods, seismic refraction method, electrical resistivity method, penetration tests, standard penetration test, static cone penetration test.

UNIT – II

Stability of Slopes: Introduction and types of slopes, slope failure and its types, stability analysis of infinite slopes, stability analysis of finite slopes, total stress analysis/ Swedish circle method/Bishop's method/ Friction circle method/ Taylor's stability chart.

UNIT – III

Earth Pressure: Introduction and types of earth pressure, earth pressure at rest/ active pressure/ passive pressure, Rankine's theory of earth pressure, Bell's equation, stress variation for C- Φ back fill, depth of tension crack, unsupported depth of excavation, Coulomb's theory, best suitable backfill, graphical methods to determine lateral earth pressure, Rebhann's method/Culmann's method.

UNIT – IV

Shallow foundation: Types of foundations, terminology, types of failures-General shear failure/Local shear failure/Punching shear failure, determination of ultimate bearing capacity, Rankine's theory/Terzaghi's theory/Skempton's theory/Meyerhoff's theory, Effect of type of shear failure/ shape of the footing/water table, Plate load test, corrections for plate load test, under pinning.

UNIT – V

Pile Foundations: Necessity – types based on load transfer mechanism/ material/ method of installation / functional use – Estimation of vertical load carrying capacity of a single pile – static formulae / Dynamic formulae / Pile load tests – Pile groups – necessity – efficiency of Pile groups - estimation of group capacity – Negative Skin friction, introduction to under-reamed piles.

Text Books:

1. Joseph E.Bowles, "Foundation analysis and Design", McGraw-Hill Publications, 2001.
2. Das, Braja M. "Principles of Foundation Engineering", cengage Publications, 2013
3. Arora, K.R., "Soil Mechanics & Foundation Engineering" Standard Publications, 2009.
4. Varghese, P.C., "Foundation Engineering", PHI Publications, 2005
5. Bikash Chandra Chatyopadhyay, Joyantha Maity Foundation Engineering 2014

References:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, New age International Publishers, 2016.
2. Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers and Distributors, 2007.

3. Principals of Foundation Engineering by Braja, M. Das, Cengage Learning Publishers, 8th Edition, 2016
4. Geotechnical Engineering by S. K. Gulhati & Manoj Datta – Tata McGraw Hill Publishing company New Delhi. 2005.
5. Pile Foundations in Engineering Practice by Shamsar Prakash
6. Foundation Engineering by Pardeep Kumar Gupta
7. Advanced Foundation Engineering, V.N.S.Murthy

Course Code	Course Title				Core / Elective		
U2ICE704	DESIGN OF STEEL STRUCTURES				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	-	-	3	40	60	3

Course Objectives

1. Learn and apply the design philosophies (working stress method and limit state method) for various steel structural components and their connections, as per the relevant standards
2. To understand the behaviour of compression members and design column bases
3. To understand the modes of failure of tension members.
4. To understand the behaviour of flexural members in the industry.
5. Learn the Behaviour of trusses and design of purlins.

Course Outcomes

After completion of the course the student will be able to:

1. Design Bolted and Welded Connection, both simple and eccentric.
2. Design the tension members.
3. Design the Flexural member.
4. Design a column and column base.
5. Analyse and design a roof truss for Gravity loads and wind loads.

UNIT – I

Materials and Specifications: Chemical composition of steel, types of Structural Steel, Residual stresses, Stress Concentration.

Basis of Structural Design: Codes and Specifications, Design Philosophies, working Stress Method, Limit State Method.

Loading and Load Combinations: Characteristic Loads, Dead Loads, Imposed Loads, Earthquake Loads, Wind Loads and Load Combinations. Partial safety factors for materials and loads.

Bolted Connections (Limit state method): Bolted Connections, Behavior of Bolted Joints, Design Strength of Ordinary Black Bolts, Design Strength of High Strength Friction Grip Bolts, Pin Connections, Simple Connections and Eccentric Connections.

Welded Connections (Limit State Method): Advantages of Welding, Types of Welds and Joints, Simple Connections and Eccentric Connections.

UNIT – II

Design of Tension Members (Limit State Method): Types of Tension Members, Design of Strands, Slenderness Ratio, Modes of Failure, Factors Effecting Strength of Tension Members, Design of Tension Members (Angles, Other sections and Rods), Lug Angles, Tension Member Splice.

UNIT – III

Design of Beams (Limit State Method): Types of Beams, Section Classification, Lateral Stability of Beams, Buckling of Real Beams, Behavior of Beams in Bending, Design of Laterally Supported and Unsupported Beams, Design of Compound Beams, Shear Strength of Beams, Maximum Deflection, Web Buckling and Web Crippling.

UNIT – IV

Design of Compression Members (Limit State Method): Introduction, Possible Failure Modes, Behavior of Compression Members, Elastic Buckling of Slender Compression Members, Behavior of Real Compression Members, Sections of Compression Members, Effective Length, Design of Compression Members with Single Section and Built-up Sections (Symmetric in both directions), Lacing and Battening, Column Splices. Design of Column Bases (Limit state method): Design of Slab Base and Gusseted Base for Column.

UNIT – V

Design of Roof Trusses (Limit State Method): Types of Trusses, End Bearings, Spacing of Trusses and Purlins, Estimation of Loads with different Roof Coverings, Self-weight of Truss, Wind Effects, Design of I-Section Purlins for Dead Load, Imposed Load and Wind Loads.

Text Books:

1. Subramanian. N, Design of Steel Structures, Oxford University Press, 2008.
2. Duggal S.K., Design of Steel Structures, 3rd Edition, Tata McGraw Hill Publishing, 2017.
3. Shiyekar M.R, Limit State Design in Structural Steel, 2nd Edition, PHI Learning Pvt. Ltd., 2013.
4. Steel Structures, Design & Behavior, By Salmon and Johnson

References:

1. Bhavikatti , S.S., Design of Steel Structures, 5th Edition, I.K. International Publishing House Pvt. Ltd. 2017.
2. P. Dayaratnam , Design of Steel Structures, S. Chand & Co. New Delhi, 2012.
3. IS- 800-2007 “ General Construction in steel - Code of Practice” Bureau of Indian Standards, New Delhi, India.
4. Design of Steel Structures by Gaylord & Gaylord.
5. Kazim S M A and Jindal R S, “Design of Steel Structures”, Prentice Hall of India, New Delhi.
6. IS 875 (Part 1): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 1 Dead Loads - Unit Weights of Building Materials and Stored Materials, Bureau of Indian Standards, New Delhi.
7. IS 875 (Part 2): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 2 Imposed Loads, Bureau of Indian Standards, New Delhi.
8. IS 875 (Part 3): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 3 Wind Loads, Bureau of Indian Standards, New Delhi.

Course Code	Course Title				Core / Elective		
U21CE705	CONTRACTS MANAGEMENT				PEC-3		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. To make students understand various contracts, their suitability and the procurement process involved in construction projects.
2. Acquire knowledge on various types of contracts used in construction
3. To make the student understand the process of tendering
4. To make student capable of understanding and reviewing various provisions included in the contract for effective management of the projects
5. To make the student understand various contract management processes involved in construction projects

Course Outcomes

After Completion of this course, the student will be able to

1. Learn the fundamentals of legal systems in construction.
2. Decide suitable contracts for a given project scenario and stakeholders of contract
3. Judge best form of contract for a specific project and design performance parameters
4. Summarize tender processing and assess various contractual provisions in a tender documents and develop bidding strategy
5. Formulate contract management processes involved in construction projects

UNIT – I

Introduction to Construction Contracts: Definitions and different type of construction contracts: Lump sum contracts, fixed price contracts, Percentage rate contracts, Cost plus contracts, Target contracts, Design-Build contracts. Condition of Contract, Parties to a Contract, Contract Formation, Advantages and disadvantages of Construction Contract

UNIT – II

Tendering: Definitions of tendering, tender form, tender documents, notice inviting tenders, work order. EOI, RFQ & RFP, Prequalification process, Project Delivery Methods: BOT, SBOO, BOOT, Tender submission and evaluation, Public Private Partnership (PPP), Detailed Project Report (DPR), Tender rejection, Contract agreement & contract documents .

UNIT – III

Contracts Clauses: Definitions of contract Clauses, General conditions & special conditions, Contract Documents, Contract conditions for payments, Time delay, Scope changes, Extra claims, Dispute Resolution, Termination of contracts, Insurance and Indemnity, Performance Bonds and Guarantees, Review and Conclusion, subcontracting.

UNIT – IV

Contract Administration: Elements of contract management, Major stake holders in construction contracts, Contract administration; Duties and responsibilities of parties, Stake holder agreements, Contract risk management, Management reporting, Dispute resolution mechanisms: Negotiation, Mediation

UNIT – V

Legal Issues in Contract: Definition and legal issues in contract, Essential requirement of a contract as per Indian Contract Act 1872, Characteristics of a good contract, Legal enforceability of contract, Breach & termination of contracts, Major stake holders in construction contracts, Overview of Activities in Contract Management.

Text Books:

1. Keith Collier, "Construction Contracts" Reston Publishing Company, Inc, Reston, Virginia.
2. Patil, B.S., "Building and Engineering Contracts" Mrs. S.B. Patil, Pune.
3. John Murdoch & Will Hughes, "Construction Contracts - Law and Management" Spon Press, Taylor & Francis Group.
4. Gajera, G.T., "Law relating to Building and Engineering Contracts in India" Butterworths
5. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000

References:

1. Govt of India, Central Public Works Department, "CPWD Works Manual 2003."

2. Govt of India, Central Public Works Department, "CPWD 7/8: General Conditions of Contracts."
3. V. K. Raina, Raina's Construction and Contract Management Vol.1 (Second Edition), SPD Publishers, 2009
4. Jimmie Hinze, Construction Contracts, Mc Graw Hill, 2001.
5. Kwaku, A., Tenah, P.E. Jose M. Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985. M.M. Tripathi Private Ltd., Bombay, 1982.
6. Patil. B.S., Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited, 2006.
7. Indian Contract Act 1892

Course Code	Course Title					Core / Elective	
U21CE706	Advanced Concrete Technology					PEC-3	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Concrete Technology	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. To recognize the effects of the rheology and early age properties of concrete on its long-term behavior
2. Develop an advanced knowledge of durability and performance of cement concrete and how it can be controlled
3. Understand the importance of various mix designs and quality control of concrete
4. Impart the methods of proportioning of concrete mixtures
5. Understand factors affecting the strength, workability and durability of concrete

Course Outcomes

After Completion of this course, the student will be able to

1. Describe Elasticity, Creep and Shrinkage properties of concrete
2. Explain the importance of durability of concrete in various environments
3. Design and develop a concrete mix design for international codes.
4. Determine the application and use of various special concrete and formwork
5. Gain ideas on non-destructive testing of concrete

UNIT – I

Introduction to micro structure of concrete- Hydrated Cement Paste-calcium silicate hydrate and calcium hydroxide, Aggregate Phase, Voids, Water-capillary water, adsorbed water, interlayer water, Interfacial Zone-significance, Relationship between microstructure and properties of concrete. Micro structure variation with time, Micro structural aspects of special concretes.

UNIT – II

Durability of concrete- Durability concept, factors affecting, reinforcement corrosion,; fire resistance, frost damage, sulfate attack, chloride attack, creep and shrinkage, deterioration of concrete, alkali silica reaction, concrete in sea water, quality control, acceptance criteria as per BIS code Durability aspects of special concrete-High strength concrete, Self compacting concrete, Geopolymer concrete, Self curing concrete.

UNIT – III

MIX DESIGN & QUALITY CONTROL: ACI method of mix design and British DoE method of mix design of mix , Acceptance criteria for compressive strength and flexural strength. Factors causing variation in the quality of concrete-Advantages of quality control

UNIT – IV

Special processes and technology for particular types of structure - Sprayed concrete; underwater concrete, mass concrete; slip form construction, Prefabrication techniques, Precast concrete and its ingredients, MIVAN shuttering, 3 D Printing in construction

UNIT – V

Concrete Fracture Mechanics Introduction Linear Elastic Fracture Mechanics, The Crack Tip Plastic Zone, Crack Tip Opening Displacement Fracture Process in Concrete Nonlinear Fracture Mechanics for Concrete Two-Parameter Fracture Model Size Effect Model The Fictitious Model by Hillerborg R-Curve Method for Quasi-Brittle Materials.

Text books:

1. Advanced concrete technology“, Zongjin Li JOHN WILEY & SONS, INC Publisher.
2. Job Thomas., “ Concrete Technology”, Cenage learning,
3. R. Santhakumar ,, Concrete Technology“, Oxford Universities Press, 2006
4. Shetty M. S., Concrete Technology“, S. Chand & Co., 2006
5. Concrete Technology by M.L.Gambhir.–TataMc.GrawHillPublishers, New Delhi

References:

1. Mehta and Monteiro, „Concrete-Micro structure, Properties and Materials“, McGraw Hill Professional
2. Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education, 2010
3. Lea, Chemistry of Cement and Concrete“, Butterworth-Heinemann Ltd, 5e, 2017
4. Bungey, Millard, Grantham – Testing of Concrete in Structures- Taylor and Francis, 2006
5. Design of Concrete Mixes by N.KrishnaRaju,CBS Publications,2000.
6. Concrete:Micro Structure,Properties and Materials byP.K.MehtaandP.J.Monteiro,.Mc.Gr aw-Hill Publishing Company Ltd.NewDelhi
7. Special Structural concretes by Rafat Siddique, Galgotia Publicatio

Course Code	Course Title				Core / Elective		
U21CE707	ADVANCED RCC DESIGN				PEC-3		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DRCS	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. To Understand the design of curved beams in plan
2. To understand the Analysis and Design and Detailing of Deep Beams.
3. To understand the behaviour of Domes, Circular slabs and their design.
4. To understand the design principles of Flat Slabs and Retaining walls.
5. To impart knowledge regarding the analysis and design of various types of RCC tanks for storage of liquids

Course Outcomes

After Completion of this course, the student will be able to

1. Analyse and Design the beams curved and plan and design of Deep beams.
2. Analyse and Design the Domes and Circular Slabs.
3. Design of Flat slab system and retaining walls
4. Design of raft foundations.
5. Design underground and overhead RCC Rectangular and circular tanks.

UNIT – I

Beams curved in plan: Introduction – Design Principles – Structural Design of beams curved in plan of circular and rectangular types

Deep Beams: Introduction – flexural and shear stresses in deep beams. – I.S. Code provisions – design of Deep beams

UNIT – II

Domes : Introduction, Nature of Stresses in Spherical Domes, Analysis of Spherical Domes, Stresses due to Wind load, Design of RC Domes.

Circular Slabs: Introduction, Slabs freely supported at edges and carrying UDL, Slabs fixed at edges and carrying UDL, Slabs simply supported at the edges with load UDL w Uniformly distributed along the circumference of a concentric circle, design of circular slabs.

UNIT – III

Flat slabs: Introduction, Components- I.S. Code Provisions – Design methods, Design for flexure and shear – Openings in Flat slabs

Retaining Walls: Retaining Walls. Types of retaining walls. Analysis and Design of Cantilever Retaining walls and counterfort retaining wall

UNIT – IV

Raft Foundations: Definitions, Types – Mat and Raft Foundation. – Structural analysis and design of Raft foundation for buildings with column grids up to three bays and two row of columns

UNIT – V

Water Tanks: Elastic Design and Detailing for RCC circular and Rectangular ground level and overhead tank. Intze tanks.

Text Books:

- 1.N.Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers 2016
- 2.H.J. Shah, Reinforced Concrete, Charoat Publishers.
- 3.P.C.Varghese, Advanced Reinforced Concrete Design, PHI, 2001.
- 4.B. C. Punmia, —Reinforced concrete structures, 7th Edition, Laxmi Publications, 1992.

References:

1. A Nilson, D Darwin, C Dolan Design of Concrete Structures, McGraw-Hill Education; 14 edition (16 August 2009), 816 pages.
2. S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, 3rd Edition, 2009, Tata Mcgraw Hill.
3. IS: 456-2000, —Code of Practice for Plain and Reinforced concrete, Bureau of Indian Standards, New Delhi, India
4. IS: 3370-2009 Part (I to IV), —Concrete Structures for Storage of Liquids – Code of Practice, Bureau of Indian Standards, New Delhi, India.
5. Design of Steel Structures, By Ram Chandra and Virendra Gehlot vol-II, 2007.
6. Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers – 2010
7. Bhavikatti S. S. “Advance RCC Design”, 3 rd Edition, New Age International Private Limited, 2008

Course Code	Course Title					Core / Elective	
U21CE708	Traffic Engineering and management					PEC-3	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. Introduce fundamental knowledge of traffic engineering
2. Deal with traffic issues including safety, planning, design, operation and control.
3. Describe basic techniques for collecting and analyzing traffic data, diagnosing problems.
4. Understand the highway capacity and performance characteristics
5. Learn the concepts of traffic design and regulations.

Course Outcomes

After Completion of this course, the student will be able to

1. Undertake various types of road traffic studies
2. Use of statistical concepts Applications in traffic engineering
3. Suggest preventive measures to avoid accidents by analyzing the traffic conditions at site.
4. Identify traffic stream characteristics and level of service
5. Design a pre-timed signalized intersection, and determine the signal splits

UNIT - I:

Basic Aspects of Traffic Engineering Aim of traffic engineering, traffic stream components and characteristics, road user characteristics, vehicle characteristics, acceleration characteristics, measure of quality, measures of separation, relationship among traffic parameters and empirical relationships, mechanics of traffic flow, macroscopic approach, microscopic approach and human factors approach, discrete distributions, binomial distribution, Poisson's distribution, exponential distribution, normal distribution.

UNIT - II:

Traffic Studies, Measurement and Analysis; Volume studies, speed studies, parking studies, Accident studies. Travel forecasting principles and techniques, design hourly volumes and speed, origin and destination studies, presentation of data and analysis, testing of hypothesis relating to improvements.

UNIT - III:

Travel Time amid Delay Studies; Various uses, travel time and delay studies, various methods, data collection and analysis, density studies and headways, gap acceptance studies, intersection delay studies, traffic flow theory, queuing theory and simulation models.

UNIT - IV:

Capacity Analysis of Traffic Facilities; Uninterrupted facilities, interrupted facilities, Level of Service, quality of service as per HCM, factors affecting LOS, computation of capacity and LOS, Measure of effectiveness, highway capacity and performance characteristics, intersection design.

UNIT - V:

Traffic Control, Design and Regulation; Traffic signals, types, principles of phasing, tune diagram, signalized intersection, saturation flow, saturation headway, capacity of lane group, concept of critical lane group, signal timing, phase plan, phase diagram, splitting of phase, clearance interval, pedestrian requirement, guidelines for protected movements, signal coordination, emerging themes, inter-modalism, access management, congestion management, environmental impact assessment.

Text Books:

1. McShane, W.R., Roess, R.P. and Prassas, E.S., Traffic Engineering. Prentice Hall, Engle wood Cliffs,1997.
2. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington,D.C.,2000.
3. Daganzo, C.R, Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc.,New York,1997.
4. Traffic and Highway Engineering, Nicholas J. Garber, and Lester A. Hoel, Cengage Learning India, 2015, Fifth Edition.

References:

1. Salter, R.J., Traffic Engineering: Worked Examples, Macmillan, London,1989.
2. Pignataro, L.J., Traffic Engineering: Theory and Practice, Prentice Hall, Englewood lifts,1973.
3. Wohl, M. and Martin, B.V, Traffic System Analysis for Engineers and Planners, McGraw Hill,New York,1983.
4. Drew, D.R., Traffic Flow Theory, McGraw Hill, New York,1964
5. Traffic Engineering, Roger P. Roess, Elena S. Prassas, and William R. McShane, Pearson, 2019, Fifth Edition.
6. Demanding Traffic Control and Management in Next Generation Networks, Hamada Alshaer, Lap Lambert Academic Publishing, 2010.

Course Code	Course Title				Core / Elective	
U21CE7P1	Mini Project				Core	
Prerequisite	Contact Hours per Week			CIE	SEE	Credits
	L	T	P			
Internship	-	-	6	50	50	3
<p>Course Objectives The objectives of this course is to:</p> <ol style="list-style-type: none"> 1. Enhance practical and professional skills. 2. Familiarize tools and techniques of systematic literature survey and documentation. 3. Expose the students to industry practices and team work 4. Encourage students to work with innovative and entrepreneurial ideas and its implementation. 5. Make students evaluate different solutions based on economic and technical feasibility <p>Course Outcomes After Completion of this course, the student will be able to</p> <ol style="list-style-type: none"> 1. Formulate a specific problem and give valuable and economical solution 2. Develop model/models either theoretical/practical/numerical form. 3. Solve, interpret/correlate the results and discussions 4. Conclude the results obtained 5. Write the documentation in standard format 						

Guidelines:

1. As part of the curriculum in the VI- semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
2. Four students will be allotted to one faculty supervisor for mentoring.
3. Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
4. Mini projects shall have inter-disciplinary/ industry relevance, which can be implemented practically.
5. The students can select a mathematical modelling based/Experimental investigations or Numerical modelling.
6. All the investigations should be clearly stated and documented with the reasons/ explanations/ Justifications.
7. The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and reference.
8. Project Review Committee: Supervisor and a minimum of two faculty members.
9. There shall be Continuous Internal Evaluation (CIE) for 50 marks and End Semester Examination for 50 marks.
10. Below mentioned Guidelines for awarding the marks both applicable for CIE & SEE

Guidelines for awarding the marks:		
Sl no.	Description	Max Marks
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20
Total Marks		50

Course Code	Course Title				Core / Elective		
U21CE7L1	Computer Application Lab				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	2	0	0	2	25	50	1

Course Objectives

The objectives of this course is to:

1. To understand the application of software in Civil engineering.
2. To Analyze and Design of structural members using Excel.
3. To Use software knowledge for solving fluid mechanics & geotechnical related problems.
4. To introduce the civil engineering-based software Staad pro.

Course Outcomes

After Completion of this course, the student will be able to

1. Demonstrate the software skills to solve civil engineering related analysis and design
2. Make use of software tool to analyze and design of RCC beams using limit state design
3. Develop computer programs for structural engineering problems
4. Analyze and solve problems related to hydraulic structures using software
5. Solve the bearing capacity and other geotechnical related problems using software.
6. Make use of Civil Engineering software STAAD PRO for analysis and design of basic elements of structure

List of Experiments to be performed:

1. Demonstration and explanation on basic commands used in Staad.pro
2. Analysis & Design determinate structures using software.
3. Analysis and design of fixed and continuous beam using software.
4. Analysis & Design of Plane Frames using STAAD Pro.
5. Analysis & Design of space frames subjected to DL & LL.
6. Analysis and design of simple steel truss using STAAD Pro.
7. Analysis and design of residential building subjected to all loads (DL, LL, WL, EL).
8. Demonstration of administrator settings of Geostudio
9. Analysis of slope stability with homogeneous and stratified soil condition.
10. Stability of slope with retaining wall
11. Settlement analysis of spread footing
12. Analysis of single pile settlement

List of Software Required

1. Staad.pro - Licensed version.
2. GEO5 - Educational version

Text Books:

1. *P. Kumar Mehta and Paulo JM Monterio* , „Concrete Microstructure properties and materials”, Tata McGraw-hill Education, 2009.
2. *CBRI, Building materials and components, India, 1990*
3. <https://www.finesoftware.eu/geotechnical-software/engineering-manuals/>

References:

1. *Gerostiza C.Z., Hendrikson C. and Rehat D.R.*, “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994
2. *Koncz T.*, “Manual of precast concrete construction”, Vol. I, II and III, Bauverlag, GMBH, 1976.
3. “Structural design manual”, *Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009*
4. SP 36 (Part-II): 1987 Compendium of Indian Standard on Soil Engineering: Part-I & II (Laboratory & Field) testing of soils Civil Engineering purposes.

Course Code	Course Title				Core / Elective		
U21CE711	Environmental Systems				OEC-3		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Analyze the physical, chemical and biological processes in environmental systems.
2. Formulate and solve governing equations for pollutant transport.
3. Analyze the engineering transport system.
4. Plan and analyze treatment systems.

Course Outcomes

After Completion of this course, the student will be able to

1. Identify an appropriate method of treatment process.
2. Design of treatment units for population growth.
3. Identify the appropriate transport systems.
4. Design and analysis of treatment systems.

UNIT – I

Basic concepts of mole and mass concentration: notations and conventions, Review of mass balance concepts.

Diffusive transport: Diffusion and Fick's first law, Calculation of molecular diffusion coefficients in air and water.

UNIT – II

Constitutive transport equation: Derivation of general transport equation and special forms i.e. continuity and NS equations and similarity between equations of mass momentum and heat dispersion laws.

Theories of mass transport: Two film theory, penetration and surface renewal theory, Boundary layer theory. Mass transport correlations.

UNIT – III

Transport in sheared reactors: Fluid shear and turbulence, transport in steady sheared fluids, turbulent sheared fluids, shear rates in mixed reactors.

Particles and fractals: Introductions, particle size spectra, solid particles and fractal aggregate geometries, measuring and calculating fractal dimensions from particle size distributions.

UNIT – IV

Coagulation in natural and engineered systems: Introduction, general coagulation equations, factors affecting the stability of aquasols, coagulation kinetics, fractal coagulation models.

UNIT – V

Finite Differences: Finite difference and Finite volume procedures for solutions of partial differential equations of Mass, Momentum and Energy transport phenomenon

Text Books:

1. Environmental Transport Processes, Bruce E. Logan, 2nd Ed., Wiley, 2012
2. Introduction to chemical transport in the environment, John S. Gulliver, Cambridge University Press, 2007
3. V. M. Eulersand E. W. Steel, "Municipal and Rural Sanitation", 6th Ed., McGraw Hill Book Company, 1965
4. F. B. Wright, "Rural Water Supply and Sanitation", 3rd Revised edition, McGraw-Hill Inc.,US, 1977

References:

1. Diffusion: Mass transfer in fluid systems, E.L. Cussler, 3rd Ed., Cambridge University Press, 2007.
2. Chemo dynamics and Environmental Modeling S. Trapp and M. Matthies, , Springer, 1998
3. Mathematics of Diffusion, Crank, J., 2nd Edition, Oxford University Press, 1975
4. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New Delhi.
5. "Manual on Water Supply and Treatment", Ministry of Urban Development, New Delhi.
6. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C", Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Course Code	Course Title					Core / Elective	
U21CE712	Urban Transportation System					OEC3	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. To discuss various urban transportation systems planning process and its components
2. To understand a variety of travel surveys and data collection procedures
3. To understand Concept of trip generation and trip distribution
4. To review different travel demand forecasting models
5. To understand computer application in Transportation planning.

Course Outcomes

After Completion of this course, the student will be able to

1. Apply the fundamental knowledge for forecasting and creating the transportation infrastructure facilities scientifically and ethically by collecting the appropriate sample data.
2. Identify the procedures for collecting the traffic related data for generating and validating transport demand models.
3. Apply four stage transportation demand modeling by creating mathematical models to understand the travel pattern and behavior of road users.
4. Apply the mathematical knowledge in solving the transportation planning related problems by analyzing transportation data.
5. Evaluate highway projects by using different economic methods and understand the role of computer applications in transportation planning.

UNIT - I:

Introduction to concepts of transportation planning process, interdependence of the land use and traffic, systems approach to transportation planning, stages in transportation planning, survey and analysis of existing conditions, forecast analysis of future conditions and plan synthesis, evaluation, program adoption and implementation.

UNIT - II:

Transportation Surveys – Introduction, definition of the study area, zoning, types of surveys, home interview, commercial vehicle, taxis, roadside interview, registration number of vehicle plate, tags on vehicles, mass transport, and analyzing the data from samples.

UNIT - III:

Trip Generation – Introduction and definition, trip purpose, factors governing trip production and attraction rates, regression methods – multiple linear regression analysis. **Trip Distribution** – concepts of trip distribution, methods of trip distribution, uniform (constant) factor method, average factor method, Fratar method, Furness method, advantages and disadvantages of growth factor methods, the gravity model.

UNIT - IV:

Modal split – General considerations, factors affecting modal split, modal split in the transportation planning process. **Traffic assignment** – purpose of traffic assignment, general principles, assignment techniques, all or nothing assignment, multiple route assignment, capacity restraint assignment, diversion curves.

UNIT - V:

Economic evaluation of highway projects – need, basics principles, methods - benefit cost ratio, net present value, First year rate of return and internal rate of return – comparison, Computer applications in Transportation planning, Potential areas of Highway Expansion

Text Books:

- 1) B. G. Hutchinson, "Principles of Urban Transport Systems Planning", McGraw –Hill, Newyork, 1974.
- 2) C. S. Papacostas and P. D. Prevedouros, "Transportation Engineering and Planning", Pearson education India,2015.

References:

- 1) L.R. Kadiyali "**Traffic Engineering and Transportation Planning**" Khanna Publishers, 2011.
- 2) Sarkar, Pradip Kumar, Maitri, Vinay, Joshi, G.J. "Transport Planning: Principles, Practice and Policies"PHILearning, 2017.
- 3) KhannaS.K.,JustoC.E.G.,VeeraraghavanA.,"**HighwayEngineering**",10thEdition, NemChand&Bros,2015.
- 4) R. Srinivasa Kumar ,**Transportation Engineering** (Railways, Airport,) Universities Press, 2014

Course-Code	Course Title			Core/ Elective		
U21MB702	LOGISTICS MANAGEMENT (LM)			Open Elective III		
Prerequisites	Contact Hour per Week			CIE	SEE	Credit
	L	T	P			
	4	-	-	40	60	3

Course Objectives: The Objectives of the Course are:

1. To facilitate the Students to plan a Career in Business and to get a clear understanding of the Logistics Management.
2. To provide insights in to the role of Logistics Management in an Organization.
3. To make them focus on Warehousing and Transportation techniques, also to expound the role of other Functional areas for an effective Supply Chain.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the History, Evaluation and various Concepts of Logistics Management.
2. Classify and compare Various Processes and Technology used in Logistics management.
3. Analyse and differentiate various strategies in Transportation and Warehousing Logistics management.
4. Analyse Various Strategic issues and Manufacturing Techniques in relation to Logistics management.
5. Develop best Network Design, Planning and Operations in Logistics management.

Unit - I:

Introduction to Logistics Management

Introduction to Logistics Management (LM)-Concept, Objectives and function of LM, conceptual framework of LM, supply chain strategy- Global Supply Chain Management, Value chain and value delivery systems for SCM, Bull-whip effect.

Unit - II:

Supply Chain Structure and Inventory in LM

Logistics Management, Intergrated logistics Management, Inbound and Outbound Logistics, Logistics Planning and strategy, Reverse Logistics. Inventory management and its role in customer service.

Unit - III:

Role of Transportation in Supply Chain

Transportation in Supply Chain, Transportation formats, and factors influencing their choice, Multi Modal transport, Warehousing – Types of warehouses, Warehousing operations, Warehouse Management Systems. Third Party warehousing, Role and Importance of handling systems.

Unit - IV:

Information Technology in LM

Information and Communication Technology in LM, Role of IT in LM. Current IT trends in LM, RFID, Bar coding. Retail SCM – problems and prospects, Role of Packaging

Unit - V:

Key Operation Aspects in Logistics

Supply chain Network Design, Distribution network in Supply Chains, Channel design, Factors influence design, role and importance of Distributors in LM, Role of Human Resources in LM. Issues in Workforce Management and Relationship Management with suppliers, Customers and employees, linkage between HRM and LM.

Suggested Books:

1. Shah, J, “Supply Chain Management”, 2009, 1st Ed. Pearson.
2. Crandall, Richard E & others, “Principles of Supply Chain Management”, 2010, CRC Press.
3. Mohanty, R.P and Deshmukh, S.G, “Essentials of Supply Chain Management”, 2009, 1st Ed. Jaico,
4. Chandrasekaran. N, “Supply Chain Management process, system and practice”, 2010, Oxford, 1st Ed.
5. Altekar, V. Rahul, “Supply Chain Management”, 2005, PHI.
6. Leenders, Michiel R and others, “Purchasing and Supply Chain Management”, 2010, TMH.
7. Coyle, J.J., Bardi E.J. Etc., “A Logistics Approach to Supply Chain Management”, 2009 Cengage, 1st Ed.
8. Stapenhurst, T, “The Benchmarking Book: A how-to-guide to best practice for Managers and Practitioners”, 2009, Elsevier.
9. Ling Li, “Supply Chain Management: Concepts, Techniques and Practices”, 1st ed, 2009, Cambridge.
10. Power Mark J & others, “The Outsourcing Hand book How to implement a successful outsourcing process”, 2007, Kogan page, 1st Ed.
11. Gustafsson K & others, “Retailing Logistics & Fresh food Packaging Managing change in the supply chain”, 2008, Kogan page, 1st Ed.
12. KachruUpendra, “Exploring the Supply Chain Theory and Practice”, 2009, Excel books.

Course-Code	Course Title			Core/ Elective		
U21MB703	MANAGEMENT OF START UPS			Open Elective-III		
Prerequisites	Contact Hour per Week			CIE	SEE	Credits
	L	T	P			
	4	-	-	40	60	3

Course Objectives:

Students should be able to understand

- To motivate students to take up entrepreneurship in future.
- To learn nuances of starting an enterprise & project management.
- To understand the design principles of solar energy systems, their utilization and performance evaluation.
- To understand the behavioural aspects of entrepreneurs and time management

Course Outcomes:

Student will be able to

1. Understand Indian Industrial Environment, Entrepreneurship and Economic growth, Small and Large Scale Industries, Types and forms of enterprises.
2. Identify the characteristics of entrepreneurs, Emergence of first generation entrepreneurs, Conception and evaluation of ideas and their sources.
3. Practice the principles of project formulation, Analysis of market demand, Financial and profitability analysis and Technical analysis.
4. Understand the concept of Intellectual Property Rights and Patents
5. Comprehend the aspects of Start-Ups.

Unit-I

Indian Industrial Environment-competence, Opportunities and Challenges. Entrepreneurship and Economic growth. Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries. Types of enterprises.

Unit-II:

Identification and characteristics of entrepreneurs. Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas and their sources. Choice of Technology - Collaborative interaction for Technology development.

Unit-III

Project formulation, Analysis of market demand, Financial and profitability analysis and Technical analysis, project financing in India.

Unit-IV

Intellectual Property Rights: Meaning, Nature, Classification and protection of Intellectual Property, the main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

Unit-V

Aspects of Start-Up: What is Start-Up, Start-up Policy, start-up strategy, Progress of startups in India, Principles of future organizations, start-up sectors, action plan for start-ups by Govt. of India.

Suggested Reading:

1. Vasant Desai, *"Dynamics of Entrepreneurial Development and Management"*, Himalaya Publishing House, 1997.
2. Prasanna Chandra, *"Project-Planning, Analysis, Selection, Implementation and Review"*, Tata McGraw-Hill Publishing Company Ltd. 1995.
3. Stephen R. Covey and A. Roger Merrill, *"First Things First"*, Simon and Schuster Publication, 1994.
4. G. S. Sudha, *"Organizational Behaviour"*, 1996.
5. Robert D. Hisrich, Michael P. Peters, *"Entrepreneurship"*, Tata Me Graw Hill Publishing Company Ltd., 5th Ed., 2005.
6. G. B. Reddy, *Intellectual Property Rights and the Law* 5th Ed. 2005 Gogia Law Agency
7. Ajit Parulekar and Sarita D'Souza, *Indian Patents Law – Legal & Business Implications*, Macmillan