



VIT[®]

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF CIVIL ENGINEERING

**M. Tech. Construction Technology
and Management**

(M.Tech. MCT)

Curriculum

(2021-2022 admitted students)



VISION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

Transforming life through excellence in education and research.

MISSION STATEMENT OF VELLORE INSTITUTE OF TECHNOLOGY

World class Education: Excellence in education, grounded in ethics and critical thinking, for improvement of life.

Cutting edge Research: An innovation ecosystem to extend knowledge and solve critical problems.

Impactful People: Happy, accountable, caring and effective workforce and students.

Rewarding Co-creations: Active collaboration with national & international industries & universities for productivity and economic development.

Service to Society: Service to the region and world through knowledge and compassion.

VISION STATEMENT OF THE SCHOOL OF CIVIL ENGINEERING

- To be internationally recognized in Civil Engineering through groundbreaking contributions and exceptional leadership for sustainable development of the society.

MISSION STATEMENT OF THE SCHOOL OF CIVIL ENGINEERING

- To pioneer the emerging technology in Civil Engineering.
- To address the complex societal scale challenges in areas of resilient infrastructure, smart and sustainable cities, water and energy security, climate change, mobility of goods and people, and environmental protection.
- To inspire and nurture innovative leaders and entrepreneurs.



M. Tech. Construction Technology and Management

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Graduates will be engineering practitioners and leaders, who would help solve industry's technological problems.
2. Graduates will be engineering professionals, innovators or entrepreneurs engaged in technology development, technology deployment, or engineering system implementation in industry.
3. Graduates will function in their profession with social awareness and responsibility.
4. Graduates will interact with their peers in other disciplines in industry and society and contribute to the economic growth of the country.
5. Graduates will be successful in pursuing higher studies in engineering or management.
6. Graduates will pursue career paths in teaching or research.



M. Tech. Construction Technology and Management

PROGRAMME OUTCOMES (POs)

- PO_01: Having an ability to apply mathematics and science in engineering Applications
- PO_02: Having an ability to design a component or a product applying all the relevant standards and with realistic constraints, including public health, safety, culture, society and environment
- PO_03: Having an ability to design and conduct experiments, as well as to analyse and interpret data, and synthesis of information
- PO_04: Having an ability to use techniques, skills, resources and modern engineering and IT tools necessary for engineering practice
- PO_05: Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and engineering problems
- PO_06: Having adaptive thinking and adaptability in relation to environmental context and sustainable development
- PO_07: Having a clear understanding of professional and ethical responsibility
- PO_08: Having a good cognitive load management skills related to project management and finance



M. Tech. Construction Technology and Management

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of M. Tech. (Construction Technology and Management) programme, graduates will be able to

PSO_01: Acquire knowledge of construction materials, construction management, project management, contract legal requirement and management of funds.

PSO_02: Innovate in technology development, engineering system implementation and interact with their peers in other disciplines in industry and society.

PSO_03: Independently carry out research / investigation to solve practical problems and write / present a substantial technical report/document



M. Tech. Construction Technology and Management

CREDIT STRUCTURE

Category-wise Credit distribution

Category	Credits
University core (UC)	27
Programme core (PC)	22
Programme elective (PE)	15
University elective (UE)	6
Bridge course (BC)	
Total credits	70



M. Tech. Construction Technology and Management

DETAILED CURRICULUM

University Core

S. No.	Course Code	Course Title	L	T	P	J	C
1.	MAT6001	Advanced Statistical Methods	2	0	2	0	3
2.	ENG5001	Fundamentals of Communication Skills	0	0	2	0	1
3.	ENG5002	Professional and Communication Skills	0	0	2	0	1
4.	FRE5001	Francais fonctionnel	2	0	0	0	2
5.	GER5001	Deutsch fuer Anfaenger	2	0	0	0	2
6.	STS5001	Essentials of Business Etiquettes	3	0	0	0	1
7.	STS 5002	Preparing for Industry	3	0	0	0	1
8.	SET5001	Science, Engineering and Technology Project – I	0	0	0	0	2
9.	SET 5002	Science, Engineering and Technology Project – II	0	0	0	0	2
10.	CLE6099	Master's Thesis	-	-	-	-	16



M. Tech. Construction Technology and Management

Programme Core

S. No.	Course Code	Course Title	L	T	P	J	C
1.	CLE5017	Construction Practices And Equipment	2	0	0	4	3
2.	CLE5018	Modern Construction Materials	2	0	0	4	3
3.	CLE5019	Construction Planning and Scheduling	2	0	0	4	3
4.	CLE5020	Contract and Administration Planning	3	0	0	0	3
5.	CLE5021	Construction Economics and Finance	3	0	0	0	3
6.	CLE5022	Supply Chain Management (SCM)	2	2	2	0	4
7.	CLE5023	Computer Application In Infrastructure Management	1	0	2	4	3



M. Tech. Construction Technology and Management

Programme Elective

Sl. No.	Course Code	Course Title	L	T	P	J	C
1.	MGT6001	Organizational Behaviour	2	0	0	4	3
2.	CLE6026	Construction Personnel Management	3	0	0	0	3
3.	CLE6027	Quality Control and Safety	2	0	0	4	3
4.	CLE6028	Project Formulation and Appraisal	3	0	0	0	3
5.	CLE6029	Infrastructure development and BOT, BOOT Projects	2	0	0	4	3
6.	CLE6030	Estimating, Tendering and Bidding	3	0	0	0	3
7.	CLE6031	Formwork for Concrete Structures	3	0	0	0	3
8.	CLE6032	Prefabricated Techniques and Management	3	0	0	0	3
9.	CLE6033	Green Building and Energy Management	3	0	0	0	3
10.	CLE6034	Automation in Construction Industry	3	0	0	0	3
11.	CLE6035	Construction Techniques of Steel and Concrete Composite Structures	3	0	0	0	3
12.	CLE6036	Construction Techniques of Deep Foundations	3	0	0	0	3
13.	CLE6037	Flexible and Rigid Pavements	3	0	0	0	3
14.	CLE6004	Repair and Rehabilitation of Structures	3	0	0	0	3
15.	CLE6008	Environmental Impact Assessment	3	0	0	0	3
16.	CLE6013	Occupational Health and Industrial Safety	3	0	0	0	3
17.	CLE6022	Urban Planning and Sustainability	3	0	0	0	3



MAT6001	ADVANCED STATISTICAL METHODS	L	T	P	J	C
		2	0	2	0	3
Pre-requisite	None	Syllabus Version				
		2.0				
Course Objectives						
1. To provide students with a framework that will help them choose the appropriate descriptive statistics in various data analysis situations. 2. To analyse distributions and relationships of real-time data. 3. To apply estimation and testing methods to make inference and modelling techniques for decision making using various techniques including multivariate analysis.						
Expected Course Outcome						
At the end of the course the students are expected to <ol style="list-style-type: none"> 1. Understand the concept of correlation and regression model and able to interpret the effect of variables, regression coefficients, coefficient of determination. 2. Make appropriate decisions using inferential statistical tools that are central to experimental research. 3. Understand the statistical forecasting methods and model fitting by graphical interpretation of time series data. 4. Construct standard experimental designs and describe what statistical models can be estimated using the data. 5. Demonstrate R programming for statistical data 						
Module:1	Basic Statistical Tools for Analysis:	4 hours				
Summary Statistics, Correlation and Regression, Concept of R^2 and Adjusted R^2 and Partial and Multiple Correlation, Fitting of simple and Multiple Linear regression, Explanation and Assumptions of Regression Diagnostics						
Module:2	Statistical inference :	9 hours				
Basic Concepts, Normal distribution-Area properties, Steps in tests of significance –large sample tests-Z tests for Means and Proportions, Small sample tests –t-test for Means, F test for Equality of Variances, Chi-square test for independence of Attributes.						
Module:3	Modelling and Forecasting Methods:	9 hours				
Introduction: Concept of Linear and Non Liner Forecasting model ,Concepts of Trend, Exponential Smoothing, Linear and Compound Growth model, Fitting of Logistic curve and their Applications, Moving Averages, Forecasting accuracy tests. Probability models for time series: Concepts of AR, ARMA and ARIMA models.						
Module:4	Design of Experiments:	6 hours				
Analysis of variance – one and two way classifications – Principle of design of experiments, CRD – RBD – LSD, Concepts of 2^2 and 2^3 factorial experiments.						
Module:5	Contemporary Issues:	2 hours				
Industry Expert Lecture						
Total Lecture hours					30 hours	
Text Book(s)						
1.	Applied Statistics and Probability for Engineers, Douglas C. Montgomery George C. Runger, 6 th edition, John Wiley & Sons (2016),					
2.	Time Series Analysis and Its Applications With R Examples, Shumway, Robert H., Stoffer, David S., 4 th edition, Springer publications (2017)					



Reference Books			
1.	The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie and Robert Tibshirani, 2 nd Edition, Springer Series, (2017)		
2.	Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computing Sciences, J. Susan Milton and Jesse Arnold, McGraw Hill education (2017)		
Mode of Evaluation: Digital Assignments, Quiz, Continuous Assessments, Final Assessment Test			
List of Challenging Experiments (Indicative)			
1.	Computing Summary Statistics using real time data		3 hours
2.	Plotting and visualizing data using Tabulation and Graphical Representations.		3 hours
3.	Applying simple linear and multiple linear regression models to real dataset; computing and interpreting the coefficient of determination for scale data.		3 hours
4.	Testing of hypothesis for Large sample tests for real-time problems.		2 hours
5.	Testing of hypothesis for Small sample tests for One and Two Sample mean and paired comparison (Pre-test and Post-test)		2 hours
6.	Testing of hypothesis for Small Sample tests for F-test		2 hours
7.	Testing of hypothesis for Small Sample tests for Chi-square test		2 hours
8.	Applying Time series analysis-Trends. Growth ,Logistic, Exponential models		2 hours
9.	Applying Time series model AR , ARMA and ARIMA and testing Forecasting accuracy tests.		3 hours
10.	Performing ANOVA (one-way and two-way), CRD, RBD and LSD for real dataset.		3 hours
11.	Performing 2 ² factorial experiments with real time Applications		2 hours
12.	Performing 2 ³ factorial experiments with real time Applications		3 hours
Total Laboratory Hours			30 hours
Mode of Evaluation: Weekly Assessments, Final Assessment Test			
Recommended by Board of Studies		25-02-2017	
Approved by Academic Council		No. 46	Date 24-08-2017



ENG5001	Fundamentals of Communication Skills	L	T	P	J	C
		0	0	2	0	1
Pre-requisite	Not cleared EPT (English Proficiency Test)	Syllabus version				
		1.0				
Course Objectives:						
1. To enable learners learn basic communication skills - Listening, Speaking, Reading and Writing						
2. To help learners apply effective communication in social and academic context						
3. To make students comprehend complex English language through listening and reading						
Expected Course Outcome:						
1. Enhance the listening and comprehension skills of the learners						
2. Acquire speaking skills to express their thoughts freely and fluently						
3. Learn strategies for effective reading						
4. Write grammatically correct sentences in general and academic writing						
5. Develop technical writing skills like writing instructions, transcoding etc.,						
Module:1	Listening	8 hours				
Understanding Conversation, Listening to Speeches, Listening for Specific Information						
Module:2	Speaking	4 hours				
Exchanging Information, Describing Activities, Events and Quantity						
Module:3	Reading	6 hours				
Identifying Information, Inferring Meaning, Interpreting text						
Module:4	Writing: Sentence	8 hours				
Basic Sentence Structure, Connectives, Transformation of Sentences, Synthesis of Sentences						
Module:5	Writing: Discourse	4 hours				
Instructions, Paragraph, Transcoding						
Total Lecture hours					30 hours	
Text Book(s)						
1.	Redston, Chris, Theresa Clementson, and Gillie Cunningham. <i>Face2face Upper Intermediate Student's Book</i> . 2013, Cambridge University Press.					
Reference Books						
1.	Chris Juzwiak <i>.Stepping Stones: A guided approach to writing sentences and Paragraphs (Second Edition)</i> , 2012, Library of Congress.					
2.	Clifford A Whitcomb & Leslie E Whitcomb, <i>Effective Interpersonal and Team Communication Skills for Engineers</i> , 2013, John Wiley & Sons, Inc., Hoboken: New Jersey.					
3.	ArunPatil, Henk Eijkman & Ena Bhattacharya, <i>New Media Communication Skills for Engineers and IT Professionals</i> , 2012, IGI Global, Hershey PA.					
4.	Judi Brownell, <i>Listening: Attitudes, Principles and Skills</i> , 2016, 5 th Edition, Routledge: USA					
5.	John Langan, <i>Ten Steps to Improving College Reading Skills</i> , 2014, 6 th Edition, Townsend Press: USA					
6.	Redston, Chris, Theresa Clementson, and Gillie Cunningham. <i>Face2face Upper Intermediate Teacher's Book</i> . 2013, Cambridge University Press.					
Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar						
List of Challenging Experiments (Indicative)						
1.	Familiarizing students to adjectives through brainstorming adjectives with all letters of the English alphabet and asking them to add an adjective that starts with the first letter of their name as a prefix.					2 hours



2.	Making students identify their peer who lack Pace, Clarity and Volume during presentation and respond using Symbols.	4 hours
3.	Using Picture as a tool to enhance learners speaking and writing skills	2 hours
4.	Using Music and Songs as tools to enhance pronunciation in the target language / Activities through VIT Community Radio	2 hours
5.	Making students upload their Self- introduction videos in Vimeo.com	4 hours
6.	Brainstorming idiomatic expressions and making them use those in to their writings and day to day conversation	4 hours
7.	Making students Narrate events by adding more descriptive adjectives and add flavor to their language / Activities through VIT Community Radio	4 hours
8.	Identifying the root cause of stage fear in learners and providing remedies to make their presentation better	4 hours
9.	Identifying common Spelling & Sentence errors in Letter Writing and other day to day conversations	2 hours
10.	Discussing FAQ's in interviews with answers so that the learner gets a better insight in to interviews / Activities through VIT Community Radio	2 hours
Total Laboratory Hours		30 hours
Mode of Evaluation: Online Quizzes, Presentation, Role play, Group Discussions, Assignments, Mini Project		
Recommended by Board of Studies		22-07-2017
Approved by Academic Council		No. 46 Date 24-8-2017



ENG5002	Professional and Communication Skills	L	T	P	J	C
		0	0	2	0	1
Pre-requisite	ENG5001	Syllabus version				
		1.1				
Course Objectives:						
<ol style="list-style-type: none"> 1. To enable students to develop effective Language and Communication Skills 2. To enhance students' Personal and Professional skills 3. To equip the students to create an active digital footprint 						
Expected Course Outcome:						
<ol style="list-style-type: none"> 1. Improve inter-personal communication skills 2. Develop problem solving and negotiation skills 3. Learn the styles and mechanics of writing research reports 4. Cultivate better public speaking and presentation skills 5. Apply the acquired skills and excel in a professional environment 						
Module:1	Personal Interaction	2hours				
Introducing Oneself- one's career goals Activity: SWOT Analysis						
Module:2	Interpersonal Interaction	2 hours				
Interpersonal Communication with the team leader and colleagues at the workplace Activity: Role Plays/Mime/Skit						
Module:3	Social Interaction	2 hours				
Use of Social Media, Social Networking, gender challenges Activity: Creating LinkedIn profile, blogs						
Module:4	Résumé Writing	4 hours				
Identifying job requirement and key skills Activity: Prepare an Electronic Résumé						
Module:5	Interview Skills	4 hours				
Placement/Job Interview, Group Discussions Activity: Mock Interview and mock group discussion						
Module:6	Report Writing	4 hours				
Language and Mechanics of Writing Activity: Writing a Report						
Module:7	Study Skills: Note making	2hours				
Summarizing the report Activity: Abstract, Executive Summary, Synopsis						
Module:8	Interpreting skills	2 hours				
Interpret data in tables and graphs Activity: Transcoding						
Module:9	Presentation Skills	4 hours				
Oral Presentation using Digital Tools Activity: Oral presentation on the given topic using appropriate non-verbal cues						
Module:10	Problem Solving Skills	4 hours				
Problem Solving & Conflict Resolution Activity: Case Analysis of a Challenging Scenario						
Total Lecture hours					30 hours	
Text Book(s)						
1.	Bhatnagar Nitin and Mamta Bhatnagar, <i>Communicative English For Engineers And Professionals</i> , 2010, Dorling Kindersley (India) Pvt. Ltd.					



Reference Books			
1.	Jon Kirkman and Christopher Turk, Effective Writing: Improving Scientific, Technical and Business Communication, 2015, Routledge		
2.	Diana Bairaktarova and Michele Eodice, Creative Ways of Knowing in Engineering, 2017, Springer International Publishing		
3.	Clifford A Whitcomb & Leslie E Whitcomb, Effective Interpersonal and Team Communication Skills for Engineers, 2013, John Wiley & Sons, Inc., Hoboken: New Jersey.		
4.	ArunPatil, Henk Eijkman &Ena Bhattacharya, New Media Communication Skills for Engineers and IT Professionals,2012, IGI Global, Hershey PA.		
Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar			
List of Challenging Experiments (Indicative)			
1.	SWOT Analysis – Focus specially on describing two strengths and two weaknesses		2 hours
2.	Role Plays/Mime/Skit -- Workplace Situations		4 hours
3.	Use of Social Media – Create a LinkedIn Profile and also write a page or two on areas of interest		2 hours
4.	Prepare an Electronic Résumé and upload the same in vimeo		2 hours
5.	Group discussion on latest topics		4 hours
6.	Report Writing – Real-time reports		2 hours
7.	Writing an Abstract, Executive Summary on short scientific or research articles		4 hours
8.	Transcoding – Interpret the given graph, chart or diagram		2 hours
9.	Oral presentation on the given topic using appropriate non-verbal cues		4 hours
10.	Problem Solving -- Case Analysis of a Challenging Scenario		4 hours
Total Laboratory Hours			30 hours
Mode of Evaluation: Online Quizzes, Presentation, Role play, Group Discussions, Assignments, Mini Project			
Recommended by Board of Studies		22-07-2017	
Approved by Academic Council		No. 47	Date 05-10-2017



FRE5001	FRANCAIS FONCTIONNEL	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	Nil	Syllabus version				
						1.0
Course Objectives:						
The course gives students the necessary background to: <ol style="list-style-type: none"> 1. Demonstrate competence in reading, writing, and speaking basic French, including knowledge of vocabulary (related to profession, emotions, food, workplace, sports/hobbies, classroom and family). 2. Achieve proficiency in French culture oriented view point. 						
Expected Course Outcome:						
The students will be able to <ol style="list-style-type: none"> 1. Remember the daily life communicative situations via personal pronouns, emphatic pronouns, salutations, negations, interrogations etc. 2. Create communicative skill effectively in French language via regular / irregular verbs. 3. Demonstrate comprehension of the spoken / written language in translating simple sentences. 4. Understand and demonstrate the comprehension of some particular new range of unseen written materials. 5. Demonstrate a clear understanding of the French culture through the language studied. 						
Module:1	Saluer, Se présenter, Etablir des contacts	3 hours				
Les Salutations, Les nombres (1-100), Les jours de la semaine, Les mois de l'année, Les Pronoms Sujets, Les Pronoms Toniques, La conjugaison des verbes réguliers, La conjugaison des verbes irréguliers- avoir / être / aller / venir / faire etc.						
Module:2	Présenter quelqu'un, Chercher un(e) correspondant(e), Demander des nouvelles d'une personne.	3 hours				
La conjugaison des verbes Pronominaux, La Négation, L'interrogation avec ' <i>Est-ce que ou sans Est-ce que</i> '.						
Module:3	Situer un objet ou un lieu, Poser des questions	4 hours				
L'article (défini/ indéfini), Les prépositions (à/en/au/aux/sur/dans/avec etc.), L'article contracté, Les heures en français, La Nationalité du Pays, L'adjectif (La Couleur, l'adjectif possessif, l'adjectif démonstratif/ l'adjectif interrogatif (quel/quelles/quelle/quelles), L'accord des adjectifs avec le nom, L'interrogation avec Comment/ Combien / Où etc.,						
Module:4	Faire des achats, Comprendre un texte court, Demander et indiquer le chemin.	6 hours				
La traduction simple :(français-anglais / anglais –français)						
Module:5	Trouver les questions, Répondre aux questions générales en français.	5 hours				
L'article Partitif, Mettez les phrases aux pluriels, Faites une phrase avec les mots donnés, Exprimez les phrases données au Masculin ou Féminin, Associez les phrases.						
Module:6	Comment écrire un passage	3 hours				
Décrivez : La Famille /La Maison, /L'université /Les Loisirs/ La Vie quotidienne etc.						
Module:7	Comment écrire un dialogue	4 hours				
Dialogue: <ol style="list-style-type: none"> a) Réserver un billet de train b) Entre deux amis qui se rencontrent au café c) Parmi les membres de la famille d) Entre le client et le médecin 						
Module:8	Invited Talk: Native speakers	2 hours				
Total Lecture hours						30 hours



GER5001	Deutsch für Anfänger	L	T	P	J	C
		2	0	0	0	2
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
The course gives students the necessary background to: <ol style="list-style-type: none"> 1. Enable students to read and communicate in German in their day to day life 2. Become industry-ready 3. Make them understand the usage of grammar in the German Language. 						
Expected Course Outcome:						
The students will be able to <ol style="list-style-type: none"> 1. Create the basics of German language in their day to day life. 2. Understand the conjugation of different forms of regular/irregular verbs. 3. Understand the rule to identify the gender of the Nouns and apply articles appropriately. 4. Apply the German language skill in writing corresponding letters, E-Mails etc. 5. Create the talent of translating passages from English-German and vice versa and To frame simple dialogues based on given situations. 						
Module:1		3 hours				
Einleitung, Begrüßungsformen, Landeskunde, Alphabet, Personalpronomen, Verb Konjugation, Zahlen (1-100), W-fragen, Aussagesätze, Nomen – Singular und Plural						
Lernziel: Elementares Verständnis von Deutsch, Genus- Artikelwörter						
Module:2		3 hours				
Konjugation der Verben (regelmässig /unregelmässig) die Monate, die Wochentage, Hobbys, Berufe, Jahreszeiten, Artikel, Zahlen (Hundert bis eine Million), Ja-/Nein- Frage, Imperativ mit Sie						
Lernziel : Sätze schreiben, über Hobbys erzählen, über Berufe sprechen usw.						
Module:3		4 hours				
Possessivpronomen, Negation, Kasus- Akkusativ und Dativ (bestimmter, unbestimmter Artikel), trennbare verben, Modalverben, Adjektive, Uhrzeit, Präpositionen, Mahlzeiten, Lebensmittel, Getränke						
Lernziel : Sätze mit Modalverben, Verwendung von Artikel, über Länder und Sprachen sprechen, über eine Wohnung beschreiben.						
Module:4		6 hours				
Übersetzungen : (Deutsch – Englisch / Englisch – Deutsch)						
Lernziel : Grammatik – Wortschatz – Übung						
Module:5		5 hours				
Leseverständnis, Mindmap machen, Korrespondenz- Briefe, Postkarten, E-Mail						
Lernziel : Wortschatzbildung und aktiver Sprach gebrauch						
Module:6		3 hours				
Aufsätze : Meine Universität, Das Essen, mein Freund oder meine Freundin, meine Familie, ein Fest in Deutschland usw						



Module:7		4 hours
Dialoge: a) Gespräche mit Familienmitgliedern, Am Bahnhof, b) Gespräche beim Einkaufen ; in einem Supermarkt ; in einer Buchhandlung ; c) in einem Hotel - an der Rezeption ;ein Termin beim Arzt. d) Treffen im Cafe		
Module:8		2 hours
Guest Lectures/Native Speakers / Feinheiten der deutschen Sprache, Basisinformation über die deutschsprachigen Länder		
Total Lecture hours:		30 hours
Text Book(s)		
1.	Studio d A1 Deutsch als Fremdsprache, Hermann Funk, Christina Kuhn, Silke Demme : 2012	
Reference Books		
1.	Netzwerk Deutsch als Fremdsprache A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, 2013	
2.	Lagune ,Hartmut Aufderstrasse, Jutta Müller, Thomas Storz, 2012.	
3.	Deutsche Sprachlehre für AUsländer, Heinz Griesbach, Dora Schulz, 2011	
4.	ThemenAktuell 1, HartmurtAufderstrasse, Heiko Bock, MechthildGerdes, Jutta Müller und Helmut Müller, 2010	
	www.goethe.de wirtschaftsdeutsch.de hueber.de, klett-sprachen.de www.deutschtraning.org	
Mode of Evaluation: CAT / Assignment / Quiz / FAT		
Recommended by Board of Studies		
Approved by Academic Council	No. 41	Date 17-06-2016



STS5001	Essentials of Business Etiquettes	L	T	P	J	C
		3	0	0	0	1
Pre-requisite		Syllabus version				
		2.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To develop the students' logical thinking skills 2. To learn the strategies of solving quantitative ability problems 3. To enrich the verbal ability of the students 4. To enhance critical thinking and innovative skills 						
Expected Course Outcome:						
<ol style="list-style-type: none"> 1. Enabling students to use relevant aptitude and appropriate language to express themselves 2. To communicate the message to the target audience clearly 						
Module:1	Business Etiquette: Social and Cultural Etiquette and Writing Company Blogs and Internal Communications and Planning and Writing press release and meeting notes	9 hours				
Value, Manners, Customs, Language, Tradition, Building a blog, Developing brand message, FAQs', Assessing Competition, Open and objective Communication, Two way dialogue, Understanding the audience, Identifying, Gathering Information,. Analysis, Determining, Selecting plan, Progress check, Types of planning, Write a short, catchy headline, Get to the Point –summarize your subject in the first paragraph., Body – Make it relevant to your audience,						
Module:2	Study skills – Time management skills	3 hours				
Prioritization, Procrastination, Scheduling, Multitasking, Monitoring, Working under pressure and adhering to deadlines						
Module:3	Presentation skills – Preparing presentation and Organizing materials and Maintaining and preparing visual aids and Dealing with questions	7 hours				
10 Tips to prepare PowerPoint presentation, Outlining the content, Passing the Elevator Test, Blue sky thinking, Introduction , body and conclusion, Use of Font, Use of Color, Strategic presentation, Importance and types of visual aids, Animation to captivate your audience, Design of posters, Setting out the ground rules, Dealing with interruptions, Staying in control of the questions, Handling difficult questions						
Module:4	Quantitative Ability -L1 – Number properties and Averages and Progressions and Percentages and Ratios	11 hours				
Number of factors, Factorials, Remainder Theorem, Unit digit position, Tens digit position, Averages, Weighted Average, Arithmetic Progression, Geometric Progression, Harmonic Progression, Increase & Decrease or successive increase, Types of ratios and proportions						
Module:5	Reasoning Ability-L1 – Analytical Reasoning	8 hours				
Data Arrangement(Linear and circular & Cross Variable Relationship), Blood Relations, Ordering/ranking/grouping, Puzzle test, Selection Decision table						
Module:6	Verbal Ability-L1 – Vocabulary Building	7 hours				
Synonyms & Antonyms, One word substitutes, Word Pairs, Spellings, Idioms, Sentence completion, Analogies						
Total Lecture hours					45 hours	
Reference Books						
1.	Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler(2001) Crucial Conversations: Tools for Talking When Stakes are High. Bangalore. McGraw-Hill Contemporary					
2.	Dale Carnegie,(1936) How to Win Friends and Influence People. New York. Gallery Books					
3.	Scott Peck. M(1978) Road Less Travelled. New York City. M. Scott Peck.					



4.	FACE(2016) Aptipedia Aptitude Encyclopedia. Delhi. Wiley publications		
5.	ETHNUS(2013) Aptimithra. Bangalore. McGraw-Hill Education Pvt. Ltd.		
Websites:			
1.	www.chalkstreet.com		
2.	www.skillsyouneed.com		
3.	www.mindtools.com		
4.	www.thebalance.com		
5.	www.eguru.ooo		
Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays, 3 Assessments with Term End FAT (Computer Based Test)			
Recommended by Board of Studies	09/06/2017		
Approved by Academic Council	No. 45	Date	15/06/2017



STS5002	Preparing for Industry	L	T	P	J	C
		3	0	0	0	1
Pre-requisite		Syllabus version				
		2.0				
Course Objectives:						
1.To develop the students’ logical thinking skills 2.To learn the strategies of solving quantitative ability problems 3.To enrich the verbal ability of the students 4.To enhance critical thinking and innovative skills						
Expected Course Outcome:						
1. Enabling students to simplify, evaluate, analyze and use functions and expressions to simulate real situations to be industry ready.						
Module:1	Interview skills – Types of interview and Techniques to face remote interviews and Mock Interview	3 hours				
Structured and unstructured interview orientation, Closed questions and hypothetical questions, Interviewers’ perspective, Questions to ask/not ask during an interview, Video interview, Recorded feedback, Phone interview preparation, Tips to customize preparation for personal interview, Practice rounds						
Module:2	Resume skills – Resume Template and Use of power verbs and Types of resume and Customizing resume	2 hours				
Structure of a standard resume, Content, color, font, Introduction to Power verbs and Write up, Quiz on types of resume, Frequent mistakes in customizing resume, Layout - Understanding different company's requirement, Digitizing career portfolio						
Module:3	Emotional Intelligence - L1 – Transactional Analysis and Brain storming and Psychometric Analysis and Rebus Puzzles/Problem Solving	12 hours				
Introduction, Contracting, ego states, Life positions, Individual Brainstorming, Group Brainstorming, Stepladder Technique, Brain writing, Crawford's Slip writing approach, Reverse brainstorming, Star bursting, Charlette procedure, Round robin brainstorming, Skill Test, Personality Test, More than one answer, Unique ways						
Module:4	Quantitative Ability-L3 – Permutation-Combinations and Probability and Geometry and mensuration and Trigonometry and Logarithms and Functions and Quadratic Equations and Set Theory	14 hours				
Counting, Grouping, Linear Arrangement, Circular Arrangements, Conditional Probability, Independent and Dependent Events, Properties of Polygon, 2D & 3D Figures, Area & Volumes, Heights and distances, Simple trigonometric functions, Introduction to logarithms, Basic rules of logarithms, Introduction to functions, Basic rules of functions, Understanding Quadratic Equations, Rules & probabilities of Quadratic Equations, Basic concepts of Venn Diagram						
Module:5	Reasoning ability-L3 – Logical reasoning and Data Analysis and Interpretation	7 hours				
Syllogisms, Binary logic, Sequential output tracing, Crypto arithmetic, Data Sufficiency, Data interpretation-Advanced, Interpretation tables, pie charts & bar chats						
Module:6	Verbal Ability-L3 – Comprehension and Logic	7 hours				
Reading comprehension, Para Jumbles, Critical Reasoning (a) Premise and Conclusion, (b) Assumption & Inference, (c) Strengthening & Weakening an Argument						



Total Lecture hours		45 hours	
Reference Books			
1.	Michael Farra and JIST Editors(2011) Quick Resume & Cover Letter Book: Write and Use an Effective Resume in Just One Day. Saint Paul, Minnesota. Jist Works		
2.	Daniel Flage Ph.D(2003) The Art of Questioning: An Introduction to Critical Thinking. London. Pearson		
3.	David Allen(2002) Getting Things done : The Art of Stress -Free productivity. New York City. Penguin Books.		
4.	FACE(2016) Aptipedia Aptitude Encyclopedia.Delhi. Wiley publications		
5.	ETHNUS(2013) Aptimithra. Bangalore. McGraw-Hill Education Pvt. Ltd.		
Websites:			
1.	www.chalkstreet.com		
2.	www.skillsyouneed.com		
3.	www.mindtools.com		
4.	www.thebalance.com		
Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays, 3 Assessments with Term End FAT (Computer Based Test)			
Recommended by Board of Studies		09/06/2017	
Approved by Academic Council		No. 45	Date 15/06/2017



SET5001	SCIENCE, ENGINEERING AND TECHNOLOGY PROJECT- I	L	T	P	J	C
						2
Pre-requisite		Syllabus Version				
Anti-requisite		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To provide opportunity to involve in research related to science / engineering 2. To inculcate research culture 3. To enhance the rational and innovative thinking capabilities 						
Expected Course Outcome:						
<p>On completion of this course, the student should be able to:</p> <ol style="list-style-type: none"> 1. Identify problems that have relevance to societal / industrial needs 2. Exhibit independent thinking and analysis skills 3. Demonstrate the application of relevant science / engineering principles 						
Modalities / Requirements						
<ol style="list-style-type: none"> 1. Individual or group projects can be taken up 2. Involve in literature survey in the chosen field 3. Use Science/Engineering principles to solve identified issues 4. Adopt relevant and well-defined / innovative methodologies to fulfill the specified objective 5. Submission of scientific report in a specified format (after plagiarism check) 						
Student Assessment : Periodical reviews, oral/poster presentation						
Recommended by Board of Studies		17-08-2017				
Approved by Academic Council		No. 47	Date	05-10-2017		



CLE6099	Master's Thesis	L	T	P	J	C
		0	0	0	0	16
Pre-requisite	As per the academic regulations	Syllabus version				
		1.0				
Course Objectives:						
To provide sufficient hands-on learning experience related to the design, development and analysis of suitable product / process so as to enhance the technical skill sets in the chosen field and also to give research orientation						
Expected Course Outcome:						
At the end of the course the student will be able to						
<ol style="list-style-type: none"> 1. Formulate specific problem statements for ill-defined real life problems with reasonable assumptions and constraints. 2. Perform literature search and / or patent search in the area of interest. 3. Conduct experiments / Design and Analysis / solution iterations and document the results. 4. Perform error analysis / benchmarking / costing 5. Synthesise the results and arrive at scientific conclusions / products / solution 6. Document the results in the form of technical report / presentation 						
Contents						
<ol style="list-style-type: none"> 1. Capstone Project may be a theoretical analysis, modeling & simulation, experimentation & analysis, prototype design, fabrication of new equipment, correlation and analysis of data, software development, applied research and any other related activities. 2. Project can be for two semesters based on the completion of required number of credits as per the academic regulations. 3. Should be individual work. 4. Carried out inside or outside the university, in any relevant industry or research institution. 5. Publications in the peer reviewed journals / International Conferences will be an added advantage 						
Mode of Evaluation: Periodic reviews, Presentation, Final oral viva, Poster submission						
Recommended by Board of Studies		10.06.2016				
Approved by Academic Council		No.41	Date	17.06.2016		



CLE5017	CONSTRUCTION PRACTICES AND EQUIPMENT	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the various techniques to be implemented in substructure construction 2. To know the launching of girders, material handling and erection of components in super structure construction. 3. To study the various types of roads; its construction procedure and equipment employed in road construction. 4. To attain the knowledge in harbour, dam, river work and pipeline construction. 5. To know the various types of equipment and its usage in different types of constructions. 6. To obtain the knowledge of equipment management, cost control in construction. 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> 1. Identify the suitable techniques to construct the structure based on site condition 2. Prepare the work schedule for any type of super structure construction. 3. Identify the techniques to implement in construction of Embankment, Retaining wall, breast wall in hill road. 4. Identify the suitable method and equipment to construct a Road, Dams, Harbour, River work and pipelines. 5. Prepare a suitable plan for erection of new plants like Batching and mixing plant, Ready mix concrete plant at site. 6. Manage and maintain the equipment and its cost control. 						
Module: 1	Sub Structure Construction	4 hours				
Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques -Dewatering and stand by Plant equipment for underground open excavation.						
Module: 2	Superstructure Construction	4 hours				
Launching girders, bridge decks, offshore platforms – Material handling - erecting lightweight components on tall structures - Erection of articulated structures - Fabrication and erection of steel trusses and frames.						
Module: 3	Highway Construction Practice	4 hours				
Embankment Construction - Ground improvement techniques, Retaining and Breast walls on hill road. Bituminous Constructions- Concrete road construction: Test - Construction equipments - Method of construction of joints in concrete pavements - IRC specifications.						
Module: 4	Dams and Harbour Construction Practice	4 hours				
Construction Methods and Equipment for Dams, Harbours, River works and Pipelines.						
Module: 5	Earthwork Equipment	4 hours				
Fundamentals of Earthwork Operations - Earth Moving operations-Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Earth Movers – capacity calculations.						
Module: 6	Forklifts and Screening Equipment	4 hours				
Forklifts and related equipment - Portable Material Bins - Conveyors - equipment used in demolition – Chain Pulley Blocks. Crushers – Feeders - Screening Equipment - Batching and Mixing						



Equipment – Hauling equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers			
Module: 7	Equipment Management	4 hours	
Factors affecting selection of equipment and methods –Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment – Depreciation Analysis, Methods of calculation of depreciation- Safety Management.			
Module: 8	Contemporary Issues	2 hours	
Total Lecture hours		30 hours	
Sample list of J component Projects		60 hours	
<ol style="list-style-type: none"> 1. Levels in the Construction and selection of equipment. 2. Detailed Equipment management schedule for construction. 3. Detailed report on selection of methods used in above ground level construction. 4. Detailed report on selection of methods used in under water construction. 5. Detailed Equipment management schedule for special construction. 			
Text Book(s)			
1.	Punmia B. C., Ashok Kumar Jain , Arun Kumar Jain , (2017), Building Construction, 11 th Edition, Lakshmi Publications, New Delhi.		
2.	Robert L. Peurifoy, Clifford J. Schexnayder, AviadShapira (2010), Construction Planning, Equipment and Methods, Indian Edition,Mc-Graw Hill-Education, New Delhi .		
References			
1.	Kumar NeerajJha, (2015), Construction Project Management, 2nd Edition, Pearson, New Delhi.		
2.	Varghese P.C., (2012), Foundation Engineering, PHI Learning Private Limited, New Delhi.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE5018	MORDERN CONSTRUCTION MATERIALS	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
1.0						
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the applications and properties of various building materials 2. To know the various types of metals and alloys 3. To understand the potential applications of architectural materials 4. To obtain the knowledge about polymer materials and smart materials 5. To know the various chemical admixtures and special concrete 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> 1. Compare the properties of most common and advanced building materials 2. Explain the role of metals and alloys in construction industry 3. Identify the required architectural materials for various buildings 4. Explain the role of polymers in construction industry 5. Outline various smart materials suitable for structures 6. Describe various properties and applications of chemical and mineral admixtures 7. Explain the properties and applications of special concrete 						
Module: 1	Building Materials	4 hours				
Cement- types - properties and testing – Aggregate – types - properties and Testing, Reinforcement – Types - Manufacturing Process - Properties – Types of Coatings & Coatings to reinforcement.						
Module: 2	Metals	4 hours				
Metals and Special Alloys of Steel - Water Jet Cut Stainless Steel, Mill Slab Steel, Tension Rods Assemblies and Cast Iron - Heat Treatment – Tendons - GI sheets, tubes and lightweight roofing materials - Aluminium and its products						
Module: 3	Architectural Materials	4 hours				
Wood and Wood Product – Glass - Floor Finishes – Paints – Tiles - Thermal insulation and acoustic absorption materials - decorative panels and laminates - architectural glass and ceramics - ferrocement.						
Module: 4	Polymers	4 hours				
Polymers- Structural Plastics and Composites- Polymer Membranes- Coatings-Adhesives, Non-Weathering Materials-Flooring and Facade Materials- Glazed Brick - Photo Catalytic Cement - Acid Etched Copper and Composite Fibres						
Module: 5	Smart Materials	4 hours				
Neoprene, Bridge pads, thermocole, Smart and Intelligent Materials – Special features –Case studies showing the applications of smart and Intelligent Materials. Petroleum products, Fibre Reinforced Polymers, Bituminous Materials						
Module: 6	Chemical and Mineral Admixtures	4 hours				
Types and properties of Chemical Admixtures - Water Proofing Compounds– sealants, engineering grouts, various types of finishes & treatments , Fly ash – silica fume – GGBFS - metakaolin - rice husk ash - properties and its application in concrete under special environment.						



Module: 7	Special Concrete	4 hours
Self-Compacting Concrete – Lightweight concrete – Self dynamic concrete – Self Healing Concrete – Nanotube concrete – High density concrete – High Performance Concrete – Ready mix Concrete – Geopolymer Concrete.		
Module: 8	Contemporary issues	2 hours
Industrial Expert Lecture		
Total Lecture hours		30 hours
List of Sample J projects		60 hours
Experimental study on strength and durability of special concretes Study on properties of building and composite materials Applications of smart and intelligent materials		
Text Book(s)		
1.	Kumar Mehta P. and Paulo J. M. Monteiro, (2014), Concrete: Microstructure, Properties and Materials, 4th Edition, McGraw-Hill, New Delhi.	
References		
1.	Shetty. M. S., (2017), Concrete Technology, S. Chand and Company Ltd, New Delhi.	
2.	Neville. A. M, (2012), Properties of Concrete, Pearson, New Delhi.	
3.	ACI 211.1-91 Reapproved 2009, Standard Practice for selecting Proportions for Normal, Heavyweight, and Mass Concrete, USA	
4.	George C. Sih, Alberto Carpinteri and Surace, G (Eds.) (2010), Advanced Technology for Design and Fabrication of Composite Materials and Structures: Applications to the Automotive, Marine, Aerospace and Construction Industry, in: Engineering Applications of Fracture Mechanics Series, Springer, Netherlands.	
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test		
Recommended by Board of Studies		21-02-2018
Approved by Academic Council	No. 49	Date 15-03-2018



CLE5019	CONSTRUCTION PLANNING AND SCHEDULING	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
1.0						
Course Objectives:						
<ol style="list-style-type: none"> To understand the importance of construction planning and organizational cultures and their impact on a project. To know the relationship between strategic plans and projects and also understand the types of project risks in an organization. To understand the importance of a complete and accurate WBS from a planning and executing point of view. To compute critical path, slack and floats for a given network diagram. To obtain the knowledge of advanced scheduling techniques and to be familiar with computerized scheduling both its limitations and advantages. To prepare resource scheduling such as material, equipment and manpower requirements to execute the project. To work out the costs associated with different construction projects. 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> Understand the importance of construction planning and organizational cultures. Discuss the relationship between strategic planning and project planning. Construct WBS and compute critical path, slack and floats for a given network diagram. Describe the advanced scheduling techniques Prepare various types of Project Information using Database Management Systems. Create scheduling for material, equipment and manpower requirements to execute the project. Estimate costs associated with different construction projects. 						
Module: 1	Planning	4 hours				
Construction Planning - Organizing, Staffing, directing, and controlling – Factors influence supply and demand of human resources – Role of HR manager – Personnel Principles -case studies						
Module: 2	Organizing	4 hours				
Requirement of Organization – Organization structure – Organization charts – Staffing Plan - Development and Operation of human resources						
Module: 3	Scheduling Techniques	4 hours				
Work Breakdown Structure (WBS) -Time Management and Scheduling -Bar chart and Gantt chart - Network methods - Network diagram - Critical Path Method -Calculation critical path , Floats/slacks - PERT – Three time estimates						
Module: 4	Resource Techniques	4 hours				
Precedence Diagram Method (PDM), Project monitoring - Updating - Target Schedule, Optimum cost and time, Scheduling with uncertain durations-Calculations for Monte Carlo Schedule Simulations-Crashing and Time-Cost Tradeoff						
Module: 5	Project Information	4 hours				
Types of Project Information - Accuracy and Use of Information -Computerized Organization and Use of Information - Other Conceptual Models of Databases - Centralized - Database Management Systems - Databases and Applications Programs –Information - Transfer and Flow.						
Module: 6	Labour and Material Utilization	4 hours				



Labour requirements, labour productivity, Equipment, Material Management, Inventory Control, Economic order quantity, EOQ for resource limitation, Resource scheduling - leveling and allocation.			
Module: 7	Cost Estimation	4 hours	
Costs Associated with Constructed Facilities - Construction Cost Estimates - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate based on Engineer's List of Quantities - Estimation of Operating Costs.			
Module: 8	Contemporary Issues	2 hours	
Total Lecture hours		30 hours	
Sample list of projects for J components		60 hours	
<ul style="list-style-type: none">• Creating a work breakdown structure to execute a project using software• Prepare ABC analysis for inventory control used in construction• Preparation of detailed cost estimation of a project			
Text Book(s)			
1.	Prasanna Chandra, (2017), Project Planning, Analysis, Selection, Implementation and Review, 8 th Edition, McGraw-Hill, New Delhi.		
Reference Books			
1.	Chitkara, K.K, (2014), Construction Project Management, 3 rd Edition, McGraw-Hill Publishing Company, New Delhi.		
2.	Alison Dykstra (2011), Construction Project Management: A Complete Introduction, Kirshner Publishing, San Francisco, USA		
3.	Jimmie W. Hinze, (2013), Construction Planning and Scheduling, 4 th Edition, Pearson, NewDelhi.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE5020	CONTRACT AND ADMINISTRATION PLANNING	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To make students who take this course be able to design sound contracts by training to interpret legal provisions and effectively administer and fulfill the requirements of a contract 2. To be able to effectively administer contract and identify tools available for contract preparation and administration 3. To identify good practice important stages of contract and wordings in contract 4. Understand jurisprudence to effectively administer contracts and a construction organization 5. To interpret the laws like Labour Laws, Tax laws and requirements and guidelines of other national and international legal regulatory bodies 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> 1. Explain the various types of construction contracts and their legal aspects. 2. Appreciate the merits and demerits of a contract form and choose the most appropriate form ensuring sufficient safeguards are agreed upon to protect the interest of the party represented from Torts, LD etc. 3. Identify and develop the stages of a tender; decide the work flow and be able to define requirements of each relevant stage 4. Prevent failure of a contract; Understand legal recourse when a contract fails irreconcilably 5. Relate legal aspects of a contract 6. Gain knowledge in tax laws 7. Understand and apply labour regulations to construction industry 8. Be aware of practice of industry in executing contracts and 						
Module: 1	Introduction	6 hours				
Definition of Contract Legal issues in contract – Standard forms of contracts- General and special conditions of contracts- Contract pricing by the client, project management consultants and the contractor, Contract correspondence and contract closure.						
Module: 2	Construction Contracts	6 hours				
Types of contracts, Documents forming a contract, General conditions of Indian contracts - International contracts - Contract administration, Law of Torts - Interpretation of contract in case of inconsistency including case study.						
Module: 3	Tenders	9 hours				
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems - World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.						
Module: 4	Arbitration	5 hours				
Comparison of Actions and Laws – Agreements – Appointment of Arbitrators – Conditions of Arbitration – Arbitration Tribunals - Powers and Duties of Arbitrator – Enforcement of Award – Arbitration and Conciliation Act 1996 - Arbitration case study.						
Module: 5	Legal Requirements	5 hours				
Insurance and Bonding – Types of Bonds - Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes- Claims and disputes - Dispute resolution techniques.						



Module: 6	Tax Laws	6 hours	
Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations			
Module: 7	Labour Regulations	6 hours	
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes – Workmen’s Compensation Act 1923 – Indian Factory Act 1948 – Tamil Nadu Factory Rules 1950 – Child Labour (Prohibition and Regulation) Act, 1986 - Other Labour Laws and Regulations.			
Module: 8	Contemporary Issues	2 hours	
Total Lecture hours			45 hours
Text Book(s)			
1.	Jimmie Hinze, (2013), Construction Contracts, 3 rd Edition, McGraw Hill, New Delhi		
2.	Sharma M.R., (2013), Fundamentals of Construction Planning & Management S.K. Kataria & Sons, New Delhi.		
References			
1.	Joseph T. Bockrath and Fredric L. Plotnick, (2013), Contracts and the Legal Environment: for Engineers and Architects, 7th Edition, McGraw Hill, New Delhi		
2.	Markanda P.C. , Naresh Markanda and Rajesh Markanda, (2016), Law Relating to Arbitration and Conciliation, 9th Edition, Lexis Nexis, New York.		
3.	Martin Brook (2016), Estimating and Tendering for Construction Work, 5th Edition, Routledge, Taylor & Francis.		
4.	Govt of India, Central Public Works Department, CPWD Works Manual 2014.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE5021	CONSTRUCTION ECONOMICS AND FINANCE	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version 1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the Economics in civil engineering 2. To understand concept of alternatives for decision making 3. To analyse financial returns 4. To evaluate the value added tax 5. To understand the concept financial management, construction costing and financial statement analysis 						
Expected Course Outcome:						
At the end of the course, the student will be able to <ol style="list-style-type: none"> 1. Understand the Economics in civil engineering 2. Understand concept of alternatives for decision making 3. Analyse financial returns 4. Evaluate the value added tax 5. Understand the concept financial management, construction costing and financial statement analysis 						
Module: 1	Economics	6 hours				
Role of Civil Engineering in Industrial Development - Support matters of Economy as related top Engineering- Market demand and supply - Quality control and Quality Production -Audit in economic law of returns, governing production.						
Module: 2	Equivalence Factors	9 hours				
Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalency - Single payment in the future - Present payment compared to uniform series payments - Future payment compared to uniform series payments - Arithmetic gradient, Geometric gradient.						
Module: 3	Financial Returns Analysis	5 hours				
Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break-even comparisons, Capitalized cost analysis, Benefit-cost analysis.						
Module: 4	Evaluating Alternative Investments	5 hours				
Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.						
Module: 5	Financial Management	6 hours				
Financial statements – Profit and loss, Balance sheets, Financial ratios, Working capital management, Inventory valuation, Mortgage Financing - International financial management-foreign currency management.						
Module: 6	Construction Costing	6 hours				
Cost estimating: Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, Cost indexes. Fixed contract Pricing- Cost plus pricing- Escalation clause- Construction cost control, Personnel costs, Equipment costs, Job in directs and markup.						
Module: 7	Financial Statement Analysis	6 hours				
Balance sheet and Profit and Loss accounts – ratios analysis, Fund flow statement, Cash flow						



statement, Working Capital Management, Financial Control - Management accounting.			
Module: 8	Contemporary Issues	2 hours	
		Total Lecture hours	45 hours
Text Book(s)			
1.	Anthony Higham, Carl Bridge, Peter Farrell, (2016), Project Finance for Construction, Routledge.		
Reference Books			
1.	Steven J. Peterson, (2012), Construction Accounting & Financial Management, Pearson, USA		
2.	Senthil, L. Madan and N. Robindro Singh (2011), Engineering Economics and Cost Analysis, Lakshmi Publications, New Delhi.		
3.	Karl E. Case, Ray C. Fair and Sharon E. Oster (2017), Principles of Economics, Pearson, New Delhi.		
4.	Leland Blank and Anthony Tarquin, (2017), Engineering Economy, 7 th Edition, McGraw Hill Education, New Delhi.		
5.	Harris, F., McCaffer, R. and Edum-Fotwe, F. (2013), Modern Construction Management,		
6.	Bose, D. C., (2010), Fundamentals of Financial management, 2nd ed., PHI, New Delhi.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE5022	SUPPLY CHAIN MANAGEMENT	L	T	P	J	C
		2	2	2	0	4
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To know and Master the fundamental concepts associated with Supply Chain Management and align with vision of the organization from the perspective of built environment and infrastructure development 2. To analyse the decision chain process in a supply chain and evolve strategies to design effective supply chains based on recognized supply chain frameworks 3. To critically evaluate designs for techno-commercial feasibility focusing on sustainability and being sensitive to socio – cultural impacts 4. To build competence in management of vendors and sub-vendors to satisfy end requirements 5. To study market scenario too evolve pricing strategy and improve competitiveness of the business 6. To gain insight into E-Commerce and ERP2.0 concepts to increase efficiency of the supply chain 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Connect recognized concepts of Supply Chain Management 2. Design Supply chain networks using recognized frameworks 3. Identify bottle necks in a supply chain. 4. Design cost effective and technical feasible Supply chains that are sustainable and is socially responsible 5. Calculate competitive prices for products delivered and add value to every aspect of the supply chain 6. Effectively be able to use ERP and other modern digital tools that industry uses 						
Module: 1	Introduction	4 hours				
Supply chain stages and decision phases process view of a supply chain- Supply chain flows- Examples - Competitive and supply chain strategies -supply chain performance - Framework for structuring drivers - Obstacles to achieving fit - Case discussions.						
Module: 2	Designing	4 hours				
Distribution Networking - Role, Design, Supply Chain Network - Role, Factors, Framework for Design Decisions - Models for facility location and capacity allocation -Discounted cash flow analysis - Evaluating network design -Decision trees.						
Module: 3	Sourcing	4 hours				
Role of sourcing, supplier – scoring and assessment, selection and contracts, Design collaboration, Case Studies.						
Module: 4	Transportation	4 hours				
Role of transportation - Factors affecting transportation decisions - Modes of transportation and their performance characteristics - Designing transportation network - Trade-off in transportation design. Routing and scheduling in transportation - International transportation - Analytical problems.						
Module: 5	Pricing	4 hours				
Role Revenue Management in the supply chain, Revenue management for: Multiple customer						



segments, perishable assets, seasonal demand, bulk and spot contracts.			
Module: 6	Coordination and Technology		4 hours
Co-ordination in a supply chain: Bullwhip effect - Obstacles to coordination - Managerial levers to achieve co-ordination - Building strategic partnerships - Supply Chain IT framework - The role of E-business in a supply chain - The E-business framework - E-business in practice - Case discussion.			
Module: 7	Emerging Concepts		4 hours
Global Logistics -Reverse Logistics - Reasons, Activities, Role - Ware house Management-Components, applications, implementation - Lean supply Chains-Sustainable supply Chains			
Module: 8	Contemporary issues		2 hours
Total Lecture hours			30 hours
Tutorial			30 hours
Minimum of three problems to be worked out by students in every tutorial class.			
Laboratory Exercises			
Creating a new project			6 hours
Creating a Work break down structure			6 hours
Types of Resources			6 hours
Activity creating and Resources allocation			6 hours
Scheduling and report preparation, Working with Primavera			6 hours
Total			30 hours
Text Book(s)			
1.	Sunil Chopra, Peter Meindl and D V Kalra (2016), Supply Chain Management: Strategy, Planning, and operation, Pearson, New Delhi		
2.	Chitalend A. K. and Gupta R. C. (2014), Materials Management: A Supply Chain Perspective - Text and Cases, PHI India, New Delhi.		
References			
1.	Jeremy F.Shapiro (2006), Modeling the supply chain, Thomson Duxbury, 2 nd Edition, Cengage Learning.		
2.	David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi and Ravi Shankar (2009), Designing and Managing the Supply Chain: Concept Strategies and Case Studies, McGraw Hill.		
3.	Saurabh Kumar Soni, (2014), Construction Management and Equipment, S.K. Kataria& Sons.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE5023	COMPUTER APPLICATION IN INFRASTRUCTURE MANAGEMENT	L	T	P	J	C
		1	0	2	4	3
Pre-requisite	CLE 5022 Supply Chain Management	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> To understand the management roles and recent developments to optimize solutions. To know various computer applications in construction management. To obtain the knowledge on modern technology in construction site and its management. 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> Connect digital tools to construction practice. Apply techniques to optimize solutions. Describe and model list of items of work and bill of quantities. Relate technology through computer program in construction. Design and construct industrial applications through automation. Manage and apply linear project construction like roads. Work on integrated solutions. Produce models with optimized solutions in construction framework. Create models with integrated automation techniques. 						
Module: 1	Introduction	2 hours				
Overview of IT Applications in Construction – Construction process – Computerization in Construction – Computer aided Cost Estimation – Developing application with database software.						
Module: 2	Optimization Techniques	2 hours				
Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications						
Module: 3	Inventory Models	2 hours				
Deterministic and Probabilistic Inventory Models - Software applications.						
Module: 4	Computer Application	2 hours				
Advanced planning and scheduling concepts – Computer applications – Case study – Adoption 3D Printing in construction.						
Module: 5	Automation Techniques	2 hours				
Introduction – Automation techniques in Surveying, Design and Construction – Automation in Road, Tunnel and Bridge Construction.						
Module: 6	Application of software in Linear Project	2 hours				
Introduction – Project – WBS – Activity – Relationship - Scheduling – Constrains – Schedule data – Resources – Role – Optimizing Project Plan – Execution and Control – Performance						
Module: 7	Building Information Modeling	2 hours				
Introduction – Parametric modeling – Visualisation – Completion of building modeling – 4D simulation using Navis works – Navigation and Clash detection.						
Module: 8	Contemporary issues	1 hour				
Industrial Expert Lecture						
Total Lecture hours					15 hours	



MGT6001	ORGANIZATIONAL BEHAVIOUR	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
Course Objectives:						
<ol style="list-style-type: none"> 1. To study about the Organizational Behavior and its importance in construction 2. To develop the conceptual understanding on organizational behavior and theories of group formations 3. To get a thorough knowledge about organizational development and effectiveness in construction 4. To identify motivation factors and implementing strategies for motivation and organizational effectiveness 5. To anticipate emerging challenges and opportunities 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Explain the nature and scope of organizational behavior 2. Appreciate the interplay of psychology, sociology and social psychology to understand behavior 3. Understand the concepts and factors influencing organization behavior. 4. Apply group theories, understand group dynamics and behavior theories for organizational development. 5. Gain knowledge of the different types of leadership and be able adapt to the functioning style of the organizations that employ them 6. Be aware of factors that determine effectiveness of an organization and evolve reward systems that elevate the performance of the individual and team 7. Understand change and be prepared and prepare team members to be able to embrace the change 8. Be aware of practice of industry in setting up organizational structures 						
Module: 1	Approaches to Organizational Behaviour	4 hours				
Understanding - Definitions – Nature and scope of Organizational behaviour – basic approaches – Importance – Fundamental Concepts.						
Module: 2	Disciplines contributing to Organizational Behaviour	4 hours				
Psychology – Sociology – Social Psychology – Role of Behavioural Science – Understanding Human Behaviour – Controlling and Directing Behaviour – Organizational Adaptation						
Module: 3	Factors Influencing Organizational Behaviour	4 hours				
The Individual – Group – Organization – Environment – Constraints – Behavioural bias – Management and Human factor – Skills of Manager – Importance of Skills – Similarities and differences among individual – Personality – Learning - Attitudes.						
Module: 4	Theories of group formation, group decision making and Techniques	4 hours				
Homous theory - Theory of propinquity – Balance Theory – Exchange Theory – Types of Group – Group cohesiveness – Group Vs Individual decision making – Advantages – Disadvantage – Efficiency – Brainstorming – Synectics – Nominal Group – The Delphi Decision Making –						



Electronic Meetings.			
Module: 5	Leadership and Motivation		4 hours
Leadership – Influencing process – Authority – Power – Influence – Trait Theories – Behaviour Theory – Motivation Process – Behaviour – Motives – Goals – Types of Needs – Primary Needs – Secondary Needs.			
Module: 6	Organizational development and effectiveness		4 hours
Importance – Process – Values – Characteristics - Advantages –Clarification – Structural Interventions – Reward system – Task – Sensitive Training – Survey – Team building – Effectiveness – Input – Output approach – Factors affecting effectiveness.			
Module: 7	Challenges in the Emerging Era		4 hours
Managing a planned change – Need for change –Structural Dis-equilibrium – Dealing with resistance to change - Leadership power and influence in Organizations, Gender & Diversity in Organizations, Managing Stress- Cross culture organization behavior- Virtual Team work			
Module: 8	Contemporary Issues		2 hours
Industrial Expert Lecture			
Total Lecture hours			30 hours
J-component			60 hours
Challenging Projects for an individual or a group will be given based on the basic and advancements in the course content.			
Text Book(s)			
<ol style="list-style-type: none"> 1. Daniel King, Scott Lawley, (2016) Organizational Behaviour Oxford University press, New Delhi 2. David Buchanan, Andrzej Huczynski, (2016), Organizational Behaviour, 9th edition, Pearson. 			
References			
<ol style="list-style-type: none"> 1. Wendell L French, Cecil H. Bell, Jr., (2011) “Organization Development: Behavioural Science Interventions for Organization Improvement”, 6th edition, Pearson Education Asia, New Delhi. 2. Jit. S. Chander (2010), “Organizational Behaviour”, 3rd edition, Vsikas Publishing House Pvt. Ltd., New Delhi. 			
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6026	CONSTRUCTION PERSONNEL MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> To understand the principles of project life cycle and legal and regulatory requirements To be familiar with modern trends in the project management and project risks on organization To know the elements of the HR function (e.g. – recruitment, selection, training and development, etc.) To outline the nature and sources of conflict and explain the different strategies and approaches used in the resolution of conflict To understand the awareness on fundamentals of human behaviour under varying stress conditions To identify the laws related to labour welfare measures. To study the appraisal and assessment methods to improve the productivity of human resources. 						
Expected Course Outcome:						
<p>Upon completion of this course, the student will be able to</p> <ol style="list-style-type: none"> Explain the principles of project life cycle and role of project managers. Discuss the modern trends in the project management and solve the project risks on organization. Know about the human resources planning and policies through proper selection and training methods Apply the different strategies and approaches used in the resolution of conflict Analyze the Organizational Behaviour related to group dynamics and team working Suggest labour welfare measures and the laws related to labour welfare measures. Apply the principles and techniques of human resource management and solution to personnel issues of typical case problems. 						
Module: 1	The Owners Perspective	6 hours				
Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers.						
Module: 2	Project Management	5 hours				
Project Management – Modern trends - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation						
Module: 3	Human Resources	5 hours				
Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection strategies – Placement and Training.						
Module: 4	Human Relations	6 hours				
Basic individual psychology – Approaches to job design and job redesign – Self managing work teams – Intergroup – Conflict in organizations – Leadership-Engineer as Managerial aspects of decision making – Significance of human relation and organizational						
Module: 5	Organizational Behaviour	6 hours				
Individual in organization – Motivation – Personality and creativity – Group dynamics, Team working – Communication and negotiation skills.						
Module: 6	Welfare Measures	6 hours				
Compensation-Wages and Salary, Employee Benefits– Safety and health – General Provident Fund – Employees Provident Fund – Group Insurance – Housing - Pension – Laws related to welfare measures.						



Module: 7	Management and Development Methods	9 hours
Employee appraisal and assessment- Employee services- Safety and Health-Discipline and Discharge- Special human resource problems, Performance appraisal-Employee Hand Book And Personnel Manual-Job descriptions and organization structure and Human relations-Productivity of Human resources.		
Module: 8	Contemporary Issues	2hours
Industry Expert Lecture		
Total Lecture hours		45 hours
Text Book(s)		
1.	Khanka S.S (2010) , Organizational Behaviour, S Chand &Company, New Delhi.	
2.	Stephen P. Robbins and Timothy A. Judge., (2017), Essentials of Organizational Behaviour, Pearson, New Delhi.	
Reference Books		
1.	Andrew Dainty, Martin Loosemore (2012), Human Resource Management in Construction: Critical Perspectives, Routledge Publications, New Delhi.	
2.	David A. Decenzo, Stephen P. Robbins, Susan L. Verhulst, (2015) Human Resource Management, Wiley publication, London.	
3.	Gary Santorella, (2017), Lean Culture for the Construction Industry: Building Responsible and Committed Project Teams, Productivity Press.	
4.	Alberto Munguia Mireles, (2014), Highway Construction and Inspection Field book: Project Construction Management Book , Universe.	
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test		
Recommended by Board of Studies		21-02-2018
Approved by Academic Council	No. 49	Date 15-03-2018



CLE6027	QUALITY CONTROL AND SAFETY	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To study the concepts of quality assurance and control techniques in construction. 2. To understand the techniques and concepts of Statistical Quality Control Methods 3. To familiarize with clauses for quality management in construction Industry 4. To study the various construction accidents and cost of construction injuries 5. To get knowledge about the various laws related to safety in construction industry 6. To study and understand the various safety concepts and requirements applied to construction industry. 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Explain the importance of quality and quality management methods in construction. 2. Construct the appropriate quality control charts and discuss the role of such charts in monitoring a process. 3. Develop an appropriate quality assurance plan to assess the ability of the service to meet its required national and international quality standards. 4. Apply the concepts of quality assurance and control techniques in construction. 5. Identify the causes, investigations and prevention of accidents in the construction jobsite. 6. Discuss about the various laws related to construction safety and worker's compensation insurance premium. 7. Create the awareness about the role of safety in all the levels of management. 						
Module: 1	Construction Quality	4 hours				
Introduction to quality - Importance - Types – Inspection - Control and enforcement-Quality Management Systems - Responsibilities and authorities in Quality assurance -Architects, Engineers, Contractors and Consultants.						
Module: 2	Quality Standards and Statistical Methods	4 hours				
Planning and control of quality - Tools and techniques for quality management - Inspection of materials and machinery - Quality audits-Statistical quality control - Tools ,Control charts - Acceptance sampling, Specification and tolerances.						
Module: 3	Quality Management	4 hours				
Quality policy - Objectives and methods -Consumer satisfaction-Ergonomics-Time of Completion-Taguchi's concept of quality- Quality standards/codes in design and construction (ISO:9000) - Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.						
Module: 4	Quality Assurance and Control	4 hours				
Objectives-Regularity agent-Owner, Design, Contract and Construction Oriented Objectives, Methods-Techniques and Needs Of QA/QC-Different Aspects of Quality-Appraisals, Factors Influencing Construction Quality-Critical, Major Failure Aspects and Analysis.						
Module: 5	Construction Accidents	4 hours				
Injury and Accidents- Causes, Investigations and Prevention of Accidents, Hazards – Types , Nature, Causes and Control Measures - Identifications and Control Techniques - Cost of Construction Injuries-Legal Implications - Site management with regard to safety –Safety training and implementation - Construction safety and health manual.						



Module: 6	Safety Policy	4 hours	
Need- Safety provisions -Factory Act-Laws related to the Industrial Safety-Measurement of Safety Performance, Safety Audit, Problem Areas in Construction Safety-Elements of an Effective Safety Programme-Job site Safety assessment- Safety Meetings-Safety Incentives			
Module: 7	Safety Organization	4 hours	
Safety Policy, Safety Record Keeping, Safety Culture-Safe Workers-Safety and First Line Supervisors- Middle Managers-Top Management Practices, Company Activities and Safety-Sub contractual obligation, Project Coordination and Safety Procedures			
Module: 8	Contemporary Issues	2 hours	
Total Lecture hours		30 hours	
Sample list of projects for J components		60 hours	
<ol style="list-style-type: none"> 1. Statistical evaluation based on field tests. 2. Quality system document reports in an ongoing construction project 3. Preparation of control charts and sampling criteria for materials. 4. Prepare life cycle costing for a construction project. 			
Text Book(s)			
1.	Brian Thorpe and Peter Sumner(2016), Quality Assurance in Construction, Routledge		
2.	Steven McCabe, (2016), Quality Improvement Techniques in Construction: Principles and Methods, Routledge		
References			
1.	Abdul Razzak Rumane, (2017), Quality Management in Construction Projects, CRC Press		
2.	Tim Howarth and David Greenwood, (2017), Construction Quality Management: Principles and Practice, Routledge		
3.	Greg Hutchins, (2010), ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification Hardcover, Wight (Oliver) Publications Inc., U.S.		
4.	Chung H.W., (2011), Understanding Quality Assurance in Construction: A Practical Guide to ISO 9000 for Contractors , Routledge.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6028	PROJECT FORMULATION AND APPRAISAL	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> To make students taking this course be able to understand about the project formulation To be able to work out the costing of construction projects To understand the project be able to do the appraisal of Projects with the inherent risks To find effective options for develop the finance model of Project through its life cycle To identify areas where private sector participation can be motivated 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> Explain the aspects to be considered when evolving the project life cycle Appreciate the various steps and FEED studies Identify the factors that will impact the time value of money Prevent losses in project because of smart identification of factors that affect operational expenses during formulation of the project Relate various risks when appraisal of a project at various stages Gain understanding of the various factors that affect the financing structure of a project and identify suitable financing models and financing agencies Understand implication of various infrastructure development models Be aware of practice of industry 						
Module: 1	Project Formulation	6 hours				
Capital investments - Generation and Screening of Project Ideas - Project identification- Project evaluation an overview, the project cycle, planning, project selection and appraisal, project quality factors and basic needs the measurement of project performance						
Module: 2	Project Initiation	5 hours				
Capital budgeting – feasibility study– market, technical, financial, economic and ecological – Market and Demand analysis- Detailed technical analysis						
Module: 3	Time Value of Money	6 hours				
Time Value of Money –Future value of single amount, Present value of single amount, Future value of an annuity, Present value of an annuity-Simple interest-Compound interest - project cash Flows.						
Module: 4	Project Costing	6 hours				
Investment Criteria- Discounting criteria-Net present value (NPV), Benefit cost ratio(BCR), internal rate of return(IRR)- Non-Discounting criteria - Pay Back Period, Accounting rate of return(ARR), Urgency - Investment analysis in practice.						
Module: 5	Project Appraisal	9 hours				
Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.						
Module: 6	Project Financing	5 hours				
Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.						
Module: 7	Private Sector Participation	6 hours				
Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Scope of						



Technology Transfer - Technology Transfer and Foreign Collaboration - Case Study.			
Module: 8	Contemporary Issues	2 hours	
		Total Lecture hours	45 hours
Text Book(s)			
1.	Prasanna Chandra, (2014), Projects -Planning Analysis Selection Implementation & Review, Fourth Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.		
References			
1.	Harold Kerzner (2013), Project Management: A Systems Approach to Planning, Scheduling, and Controlling , Wiley India, New Delhi		
2.	United Nations Industrial Development Organization (UNIDO) Manual for the preparation of Industrial Feasibility Studies, (IDSI Reproduction), Bombay, 2007.		
3.	Mohamed Hegab, (2014), Public Private Partnerships for Highway Projects: Project Selection and Decision Analysis, Create space Independent Publisher, USA.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6029	INFRASTRUCTURE DEVELOPMENT AND BOT, BOOT PROJECTS	L	T	P	J	C
		2	0	0	4	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To know the infrastructure development polices available in central and state governments of India 2. To understand the benefits and challenges in infrastructure privatization 3. To obtain the knowledge of different types of risks in National and International Infrastructure Projects 4. To understand the economic constraints and environmental sustainability to develop a management plan for critical infrastructure structures essential for the needs of society. 5. To study about the integrated framework used for successful infrastructure planning and management 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Interpret the polices available in central and state governments of India and their application in infrastructure development. 2. Discuss the challenges in privatization of water supply, power and road transportation Infrastructure in India 3. Apply the concepts of project appraisal techniques for the development and management of public infrastructure projects and determine feasible project milestones. 4. Assess the various risks on infrastructure privatization and identify methods for the management of risks. 5. Describe the interplay between engineering project, infrastructure management and sustainability in the complex real-world situations 6. Identify the principles of strategic planning and risk analysis in successful project and infrastructure management 7. Explain the case studies of International projects and select project management practices to meet the needs of stakeholders 						
Module: 1	An Overview of Infrastructure Engineering					4 hours
Overview on infrastructure development polices of central and state governments in India. Programmes and initiatives for development of roads, railways, airports, and urban infrastructure in India.						
Module: 2	Role of Public and Private Sector					4 hours
A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization , Challenges in Privatization ,Water Supply, Power, Infrastructure, Road Transportation Infrastructure in India – Case studies						
Module: 3	Infrastructure Planning					4 hours
Overview of various planning tools - Project appraisal by financial analysis, economic analysis, and environmental and societal impact assessments - Concept of sustainable infrastructure development.						
Module: 4	Infrastructure Implementation Risks					4 hours
Mapping and Facing the Landscape of Risks in Infrastructure Projects, Core Economic and Demand Risks, Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Challenges in Construction and Maintenance of Infrastructure – Case studies.						
Module: 5	Environmental and Social Impact Assessment Aspects					4 hours
Categories, Attributes and Parameters, Identification of Environmental and Social Impacts over Project Area and over Project Cycle. Special Considerations Involving Land and Water Interrelationships -						



Environmental Laws and Regulations			
Module: 6	Strategies for Successful Infrastructure Project Implementation		4 hours
Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects. Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.			
Module: 7	Private Sector Participation		4 hours
International projects - Detailed Project Reports (DPR) / Build Own Operate (BOO) / Build Own Operate Transfer (BOOT) Projects / Build Operate and Transfer (BOT) - case studies.			
Module: 8	Contemporary Issues		2 hours
Total Lecture hours			30 hours
Sample list of J component Projects			60 hours
Prepare detailed case study about different metros, highways, high rise buildings, Port construction etc., related to infrastructure development.			
Text Book (s)			
1.	Mohammed M. Ettouney, Sreenivas Alampalli, (2016) Risk Management in Civil Infrastructure in: Civil Infrastructure Health and Sustainability Series, CRC Press, London.		
Reference Books			
1.	Amareshwar Mishra and G C Tripathi , (2014), Management of Risk in Infrastructure Projects, GABD Publications, New York.		
2.	Anjaneyulu, Y and Manickam, V, (2012), Environmental Impact Assessment Methodology. B.S. Publications, Hyderabad.		
3.	Jeffrey Delmon (2015), Private Sector Investment in Infrastructure: Project Finance, PPP Projects and PPP Frameworks, Kluwer Law International.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6030	ESTIMATING, TENDERING AND BIDDING	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the various types of estimates and process involved in sanction of budget for a project. 2. To study about analysis of rate and standard methods followed by different organizations. 3. To attain the knowledge about the specification and its importance in a project. 4. To know the about the tendering and its process in construction. 5. To attain the knowledge about contracts, types of contracts, contract documents and roles and functions of participants to the contract. 6. To obtain the knowledge about the conditions of contract, Bidding and Bidding models. 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> 1. Prepare the project cost estimation and detailed estimate for getting approval of projects. 2. Find the rate for an item of work in a project by using a standard methods. 3. Prepare a detailed specification as per available drawing and detailing 4. Prepare a tender document for a budget sanctioned project. 5. Identify the suitable construction contract method and able to prepare the contract document. 6. Identify the suitable bidding models and also estimate the overhead charges in a project. 						
Module: 1	Estimation	5 hours				
Project cost estimation - Approximate Estimate and administrative approval - expenditure sanction - Detailed Estimate.						
Module: 2	Rate Analysis	5 hours				
Rate analysis - standard methods as followed by government organizations for tendering purposes - as followed by contractor organizations for bidding Purposes.						
Module: 3	Specifications	6 hours				
Definitions, relationship with drawings, purpose, benefits, organization of specification, drafting/writing the specifications, types of specifications.						
Module: 4	Tendering Process	9 hours				
Preparation of tender documents estimating, pre-qualification, bid evaluation, award of contract, project financing and contract payments, contracts close out and completion, E-tendering.						
Module: 5	Contract Agreement	6 hours				
Contracts, types of construction contracts, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract.						
Module: 6	Conditions of Contract	6 hours				
Clarification by parties to contract, obligations and responsibilities of the parties, protection and indemnification, bonds and insurance, subsurface conditions, inspection of work, change of work, rejected work and deficiencies.						
Module: 7	Bidding	6 hours				
Bidding models and bidding strategies, Owner's and contractor's estimate - Overhead charges - Internationally adopted formulae. Enlistment of contractors.						



Module: 8	Contemporary Issues	2 hours	
Total Lecture hours		45 hours	
Text Book(s)			
1.	Jimmie Hinze, (2013) , Construction Contracts, McGraw Hill, New Delhi		
Reference Books			
1.	Will Hughes, Ronan Champion, John Murdoch, (2015), Construction Contracts: Law and Management, Routledge.		
2.	Construction Specifications Institute, (2011), The CSI Construction Contract Administration Practice Guide, Wiley.		
3.	Brian Greenhalgh, (2016), Introduction to Construction Contract Management, Routledge.		
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6031	FORMWORK FOR CONCRETE STRUCTURES	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> To develop the conceptual understanding of design, construction and erection of formwork. To impart the knowledge about different types of form work used for special structures. 						
Expected Course Outcome:						
At the end of the course, the student will be able to <ol style="list-style-type: none"> Carryout the detailed planning of form works used for construction of different structures Identify the suitable Materials for Formwork Calculate the various loads on the formwork and its accessories Design the form works for construction of different structures Execute the different techniques used for construction and erection of form work. Analyse the form work for shell type structures Carryout the detailed planning of Slip Forms and Scaffolds 						
Module: 1	Planning for Form Work	6 hours				
Introduction –Types of Form work- Forms for foundations, columns, beams walls etc., General objectives of formwork building - Detailed planning - Calculation of labour constants Scaffold frames - Framed panel formwork						
Module: 2	Materials for Formwork	6 hours				
Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel – Aluminum						
Module: 3	Formwork Accessories & Pressures	6 hours				
Formwork Accessories -Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.						
Module: 4	Design of Forms and Shores	9 hours				
Design Principles - Allowable stresses - Design of Wall forms - Slab forms - Beam forms - Column forms - Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.						
Module: 5	Building and Erecting the Form Work	6 hours				
Carpentry Shop and job mill - Forms for Footings - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.						
Module: 6	Forms for Domes and Tunnels	5 hours				
Hemispherical, Parabolic, Translational shells - Typical barrel vaults - Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts.						
Module: 7	Slip Forms and Scaffolds	5 hours				



Slip Forms - Principles -Types - advantages - Functions of various components - Planning - Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold - Single pole scaffolds - Truss suspended - Gantry and system scaffolds.			
Module: 8	Contemporary Issues		2 hours
Total Lecture hours			45 hours
Text Book(s)			
1.	Oberlender G.D and Peurifoy R. L. (2010), Formwork of Concrete Structures, 4th Edition McGraw Hill Education, New Delhi.		
2.	Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.		
Reference Books			
1.	Kumar. NeerajJha, (2017), Formwork for Concrete Structures, McGraw Hill Education, New Delhi.		
2.	Leonard Koel , (2015), Concrete Formwork, American Technical Publisher, USA.		
3.	ACI 347R-14: Guide to Formwork for Concrete, ACI Committee 347, American Concrete Institute.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6032	PREFABRICATED TECHNIQUES AND MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the design principles related to prefabrication elements. 2. To obtain knowledge on the concepts of production, transportation, assembling & erection of precast buildings. 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe various structural systems and standard organizing requirements. 2. Identify and differentiate structural behaviour of building elements. 3. Design building elements and applications. 4. Identify and describe working principles of various joints. 5. Identify and describe working principles of various connections. 6. Apply principles and describe assembling process. 7. Identify and describe various tools in assembling and erection of buildings. 8. Design and detail precast and activities by innovation. 						
Module: 1	Introduction	7 hours				
Types of prefabrication, prefabrication systems and structural schemes- Disuniting of structures- Structural behaviour of precast structures - Specific requirements for planning and layout of prefabrication plant - IS Code specifications.						
Module: 2	Precast Cast Elements	7 hours				
Handling and erection stresses- Application of prestressing of roof members; floor systems two way load bearing slabs, pre stressed beam , Precast column -precast shear walls Wall panels, hipped plate and shell structures.						
Module: 3	Prefabricated Design	7 hours				
Designing and detailing prefabricated units for 1) industrial structures 2) Multistory buildings and 3) Water tanks, silos bunkers etc., 4) Application of prestressed concrete in prefabrication.						
Module: 4	Joints	6 hours				
Basic mechanism- Dimensioning and detailing of joints for different structural connections; compression joint-shear joint - tension joint						
Module: 5	Connections	6 hours				
Pin jointed connection-moment resisting connections- beam to column- column foundation connections						
Module:6	Prefabricated Buildings	6 hours				
Production, Transportation & erection- Shuttering and mould design Dimensional tolerances- Erection of R.C. Structures, Total prefabricated buildings assembly Process						
Module:7	Machinery and Equipment	4 hours				
Plant machinery, casting yard- casting and stacking						
Module: 8	Contemporary issues	2 hours				
Total Lecture hours						45 hours
Text Book(s)						
1.	KimS. Elliot (2017), Precast Concrete Structures, CRC Press					



Reference Books			
1. Handbook of Precast Concrete Buildings (2016) ICI publications.			
2. Ryan E. Smith, (2010), Prefab Architecture: A Guide to Modular Design and Construction, John Wiley and Sons, London.			
3. Hubert Bachmann and Alfred Steinle, (2011), Precast Concrete Structures, Wiley VCH.			
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6033	GREEN BUILDING AND ENERGY MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To study about the concepts of green building and low energy approaches. 2. To get a thorough knowledge about Green building systems, auditing and energy management. 3. Recognize and demonstrate methods for green project management, certification registration and documentation and green rating system compliance. 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Understand the concepts and factors influencing green building concepts, systems and energy management. 2. Impact of indoor environmental quality on occupant well-being and comfort relevant to 21st century in India 3. Identify and compare existing energy codes, green building codes and green rating systems. 4. Study about the fundamentals of energy and energy production systems pertaining to Residential, Commercial, Institutional and Public Buildings. 5. Able to conduct energy audit and apply conservation and maintenance measures 6. Demonstrate the energy management of electrical equipment and appliances in buildings 7. Use low embodied energy industrial and building materials and cost effective building technologies 						
Module: 1	Introduction	6 hours				
Green Composites for buildings - Concepts of Green Composites - Water Utilisation in Buildings, Low Energy Approaches to Water Management - Management of Solid Wastes , Sullage Water and Sewage - Urban Environment and Green Buildings - Green Cover and Built Environment.						
Module: 2	Green Building Systems	6 hours				
Comfort in Building , Thermal Comfort in Buildings- Issues, Heat Transfer Characteristic of Building Materials and construction techniques , Incidence of Solar Heat on Buildings-Implications of Geographical Location- Green management in India - relevance in twenty first century.						
Module: 3	Green Building Auditing	6 hours				
Environmental reporting and ISO 14001, Climate change business and ISO 14064 , Energy and resource conservation-Principles, Design of green buildings-rating systems-LEED Standards – Indian green building council rating system for various types of projects.						
Module: 4	Energy	9 hours				
Fundamentals of Energy - Energy production systems - Heating, Ventilating and Air conditioning - Solar Energy - Energy Economic Analysis - Energy Conservation and Audits - Domestic Energy Consumption - Savings - Primary Energy use in Buildings – Residential - Commercial - Institutional and Public Buildings.						
Module: 5	Energy Efficiency	6 hours				
Energy in Building Design-Energy Efficient and Environmental Friendly Building- Climate, Sun and solar radiation-Psychometrics-Passive Heating and Cooling Systems- Energy Audit-Types - analysis of results-Energy flow diagram-Energy consumption/Unit production- Identification of wastage-Priority of conservative measures-Maintenance of Energy Management Programme						
Module: 6	Energy Management	5 hours				
Energy Management of Electrical Equipment-Improvement of Power Factor-Management of Maximum						



Demand- Energy Savings in Pumps – Fans – Compressed Air Systems-Lighting Systems-Air Conditioning Systems –Operation and Maintenance- Modifications- Energy Recovery Dehumidifier-Water Heat Recovery-Steam Plants.			
Module: 7	Alternate Energy Resources		5 hours
Industrial and Buildings Wastes - Biomass Resources for buildings - Utility of Solar energy in buildings concepts - Low Energy Cooling - Case studies of Solar Passive Cooled and Heated Buildings - Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials. Cost Effective building technologies.			
Module: 8	Contemporary Issues		2 hours
Industrial Expert Lecture			
Total Lecture hours			45 hours
Text Book(s)			
1.	Osman Attmann, (2010), “Green Architecture Advanced Technologies and Materials”. McGraw Hill.		
References			
1.	Md. Zakiur Rahman, Most. Sharmin Islam, Md. Shahedur Rashid, (2012) “Practice of Green Building Technologies and Water Conservation Process” LAP Lambert Academic Publishing.		
2.	Sam Kubba, (2012), “Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes” Elsevier Science.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6034	AUTOMATION IN CONSTRUCTION INDUSTRY	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version 1.0				
Course Objectives:						
<ol style="list-style-type: none"> To get knowledge about application of automation and use of robots in construction. To learn the basic concept of Sensors and inspection To study the existing and prototype equipment for construction. To study on Data networking, robotic technologies for prefabrication elements. 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> Understand the application of building management system and automation in on and off site projects. Solve the construction issues through robotic techniques. Application of computer in construction Information processing Understand the concepts of Communication and office automation system Application of Robotics in Construction 						
Module: 1	Introduction	6 hours				
Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS- Review and analysis of state- of –art in construction automation						
Module: 2	Sensors and inspection	6 hours				
Field sensors actuators, controllers, non-destructive evaluation, data acquisition , examples of sensors in existing automated equipment						
Module: 3	Off and On site automation in construction	6 hours				
Off- site automation in construction Information processing (computer applications), materials processing , case study (concrete batch plant) - Existing and prototype equipment for construction – case study (concrete placement and finishing), final product design session						
Module: 4	Building Automation	9 hours				
Introduction to building automation systems – components– Heating, ventilation, and air conditioning (HVAC)– Lighting – Electrical systems water supply and sanitary systems– Fire safety – security -Communication and office automation system -Water pump monitoring & control - Control of Computerized HVAC Systems						
Module: 5	Networking	6 hours				
Data networking– IBMS system and its components – Centralized control equipment’s – substation and field controllers – Gamma building control – energy-efficient building and room automation.						
Module: 6	Robotics in Construction	5 hours				
Automation and robotic technologies for customized component, module and building prefabrication- Elementary technologies and single – Task construction robots - Site automation-robotic on site factories.						
Module: 7	Construction Robots	5 hours				
Selecting robot- Activated concrete cutting robot, concrete floor finishing robot- Ceiling panel positioning robot- Exterior wall painting robot-safety and training- case studies.						



Module: 8	Contemporary Issues	2 hours	
Industrial Expert Lecture			
Total Lecture hours		45 hours	
Text Book(s)			
1.	Javad Majrouhi Sardroud, (2011), “Automated Management of Construction Projects” LAP Lambert Academic Publishing.		
2.	Wang Shengwei, (2010), “Intelligent Buildings and Building Automation” Taylor & Francis Group.		
References			
1.	Majrouhi Sardroud Javad, (2014), “Automation in Construction Management” Scholars' Press.		
2.	HongleiXu and Xiangyu Wang, (2014), “Optimization and Control Methods in Industrial Engineering and Construction (Intelligent Systems, Control and Automation: Science and Engineering)” Springer.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6035	CONSTRUCTION TECHNIQUES OF STEEL AND CONCRETE COMPOSITE STRUCTURES	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> To introduce the concept of steel-concrete composite construction and their applications in engineering To understand the various types of connections in steel & steel-concrete composite construction To learn the methodology, construction sequence & techniques of framed industrial structures To equip students with basic concept of sandwich construction 						
Expected Course Outcome:						
At the end of the course, the student will be able to						
<ol style="list-style-type: none"> Envisage the behaviour of steel-concrete composite members Perform limit state design for steel structures Identify suitable connections in steel structures and provide connection details Prepare and propose suitable construction sequence and techniques for framed industrial structures Identify and propose suitable materials for sandwich constructions 						
Module: 1	Introduction	5 hours				
Introduction to Steel - Concrete Composite Construction - Theory of Composite Structures - Introduction to Steel - Concrete - Steel - Sandwich Construction - Behaviour of composite beams and columns						
Module: 2	Steel Structures	9 hours				
Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), SP38. IS:4000- 1992, codes for welded connections , Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, design load combinations.						
Module: 3	Connections	6 hours				
Bearing type joints - Unstiffened and stiffened seat connections - Moment resisting connection of brackets-Bolted and welded-semi-rigid connections - Types of weldings – Types of rivets.						
Module: 4	Industrial Buildings	6 hours				
Industrial buildings- construction techniques of braced and unbraced - Gable frames with gantry- Rigid industrial frames – Fixing and assembly of steel structures.						
Module: 5	Special Structures	6 hours				
Introduction to steel-concrete composite structures - construction techniques for composite structures – composite beam – column construction - shear connectors – behaviour – flexural stress – longitudinal shear transfer – transfer shear.						
Module: 6	Sandwich Constructions	5 hours				
Basic design concept of sandwich construction – Materials used for sandwich construction – Failure modes.						
Module: 7	Fabrication and assembly	6 hours				
Various open and closed mould process – fibers types – resins types – properties and application – composite structures – maintenance and repair.						
Module: 8	Contemporary Issues	2 hours				
Total Lecture hours		45 hours				



Text Book(s)			
1.	Johnson R.P. (2012), Composite Structures of Steel and Concrete: Beams, Slabsm Columns and Frames for Buildings, Wiley India Pvt Ltd.		
2.	Brian Uy and Zhong Tao (2018), Behaviour and Design of Composite Steel and Concrete Building Structures ,CRC Press.		
Reference Books			
1.	Panchal D R, (2014), Composite Steel-Concrete Structures, Scholars Press.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies	21-02-2018		
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6036	CONSTRUCTION TECHNIQUES OF DEEP FOUNDATIONS	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	Nil	Syllabus version				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the various types of deep foundations. 2. To know the various methods and techniques involved in construction of deep foundations 3. To know the various equipment involved in construction of deep foundation. 4. To understand the management and safety requirements in construction of deep foundations 5. To know the concept of sheet piles, coffer dams and reinforced earth walls. 						
Expected Course Outcome:						
<p>Upon completion of this course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Understand the various types of deep foundations. 2. Know the various methods and techniques involved in construction of deep foundations 3. Know the various equipment involved in construction of deep foundation. 4. Understand the management and safety requirements in construction of deep foundations. 5. The concept of sheet piles, coffer dams and reinforced earth walls. 						
Module: 1	Introduction to deep foundations	6 hours				
Introduction- Preliminary investigations, subsurface exploration, data interpretation and estimation of various sub-soil properties; Types of deep foundations; Requirements for deep foundations; Codal provisions on safety requirements for deep foundations.						
Module: 2	Bored piles	5 hours				
Classification of bored piles; Construction methods and construction sequences of bored piles; Equipment's used for boring, drilling and concreting; Piling supervision and quality assurance; Design considerations and pile capacity						
Module: 3	Drivenpiles	6 hours				
Classification of driven piles; Selection of type of piles and method of installation; Pile driving equipment's; Construction and quality assurance of driven piles; Advantages and disadvantages of driven piles; Pile damages and pile integrity test; Design considerations and pile capacity						
Module: 4	Well Foundations	5 hours				
Types of wells or caissons; Different shapes of well; Drilled shafts and caissons; Methods and construction sequences; Design procedure; Advantages and disadvantages of well foundation.						
Module: 5	Diaphragm wall	6 hours				
Deep excavations and protection systems; Applications of diaphragm wall; Diaphragm wall construction methods; Design procedure; Advantages and disadvantages.						
Module: 6	Sheet piles and Cofferdams	7 hours				
Sheeting and bracing systems in shallow and deep open cuts in different soil types –Cantilever sheet piles, Anchored sheet piles; Construction methods and sequences; Design procedure; Merits and demerits. Types of Cofferdams; Cofferdams components and construction sequences; design procedure for cellular coffer dam; merits and demerits						
Module: 7	Reinforced Earth Walls	7 hours				



Introduction; Advantages of RE walls; Behaviour of RE walls; Materials for reinforced earth structures; Soil-reinforcement interaction; Internal and external stability conditions; Design criteria; Field applications of RE walls.			
Module: 8	Contemporary issues	3 hours	
Total Lecture hours		45 hours	
Text Book(s)			
1.	Bowles, J. E., (2011), Foundation Analysis and Design, 7 th Edition, McGraw Hill Book Co., New York.		
2.	Das. B. M., (2010), Principles of Foundation Engineering, CL Engineering.		
Reference Books			
1.	Huang A.B., Yu H.S, (2018) Foundation Engineering Analysis and Design, CRC Press, Taylor & Francis group.		
2.	Fang. H.Y.,(2012), Foundation Engineering Handbook, Springer Science and Business Media.		
3.	Varghese. P. C., (2009), Design of Reinforced Concrete Foundations, Prentice Hall of India, New Delhi.		
4.	Murthy. V. N. S., (2009), Soil Mechanics and Foundation Engineering – CBS Publications, Delhi.		
5.	Tomlinson M and Woodward J. (2008). Pile Design and Construction Practice” 5 th Edition. Taylor and Francis.		
6.	K. R. Arora., (2011) Soil Mechanics and Foundation Engineering, Standard publishers		
7.	BIS 2911 (Part 1/Sec 1, Sec 2, Sec 3 and Sec 4) (2010) Design and construction of pile foundations-code of practice (Driven cast in-situ concrete piles), Bureau of Indian Standards, New Delhi.		
Mode of Evaluation: Continuous Assessment Test, Final Assessment Test, Quiz, Assignments			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6037	FLEXIBLE AND RIGID PAVEMENTS	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. To enable the student to identify the materials that suit pavement construction. 2. To enable the student to design flexible and rigid pavements. 3. To make the student familiar with the methods of constructing pavements. 4. To enable the student to measure pavement distresses and design overlays. 						
Expected Course Outcome:						
<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Evaluate the suitability of soil for being used as subgrade for pavements and propose methods to prepare a stable subgrade. 2. Choose the bitumen that is suitable for pavement in a particular site and design the flexible pavement mix. 3. Design a flexible pavement using IRC and Asphalt Institute methods. 4. Evaluate materials for their suitability in using for rigid pavements. 5. Design a rigid pavement using IRC method. 6. Describe methods of flexible and rigid pavement construction. 7. Identify and measure pavement distresses and design overlays. 						
Module: 1	Subgrade	9 hours				
Significance of subgrade soil – soil classification – evaluation of soil strength – CBR and plate load test – earth work grading – construction of embankments and cuttings – preparation of subgrade – quality control tests – subgrade stabilization						
Module: 2	Materials for Flexible Pavement	6 hours				
Bitumen – types and grades – properties and testing of materials used in granular layers and bituminous layers – Types of granular and bituminous mixes — mix design for granular materials – bituminous mix design - super pave concepts – new materials like polymer modified bitumen, geosynthetics etc.						
Module: 3	Design of Flexible Pavements	6 hours				
Principle, design steps, advantages and applications of different pavement design methods – Group Index, CBR, McLeod, Kansas triaxial test, IRC and Asphalt Institute methods						
Module: 4	Materials for Rigid Pavement	6 hours				
Cement – grades – chemical composition – hydration of cement – testing – admixtures – fibres - properties and testing of pavement quality concrete – mix design – acceptance criteria						
Module: 5	Design of Rigid Pavements	6 hours				
Stresses and deflections in rigid pavements – Westergaard’s analysis, Bradbury’s coefficients, IRC design charts – wheel load stress, warping stress, frictional stress and combination of stresses – types of joints – Design of slab and joints – IRC method of design						
Module: 6	Construction Procedures	5 hours				
Methods of construction and field control checks for various types of flexible pavement layers – recycling of bituminous materials. Cement concrete pavements – methods of construction of various layers – joints-quality control tests						
Module: 7	Evaluation and Maintenance	5 hours				



Distresses in flexible and rigid pavements – structural and surface condition evaluation techniques – maintenance strategies - pavement performance prediction concepts and models – design of overlays			
Module: 8	Contemporary Issues	2 hours	
		Total Lecture hours	45 hours
Text Book(s)			
1.	Prithvi Singh Kandhal, (2016), Bituminous Road Construction In India, Prentice-Hall of India Pvt. Ltd.,		
2.	Norbert J. Delatte, (2015), Concrete Pavement Design, Construction, and Performance, CRC Press, 2 nd edition.		
References			
1.	Athanasios Nikolaidis, (2014), Highway Engineering: Pavements, Materials and Control of Quality, CRC Press, 1 st edition.		
2.	R Srinivasa Kumar, (2015), Pavement Evaluation and Maintenance Management System, Universities Press (India) Private Limited.		
3.	Rao G. Venkatappa, Rao K. Ramachandra, Pahari Kausik, Rao D.V. Bhavanna, (2015), Highway Material Testing and Quality Control, I K International Publishing House.		
4.	Rajib B. Mallick, Tahar El-Korchi, (2013), Pavement Engineering: Principles and Practice, CRC Press, 2 nd edition,.		
Mode of Evaluation : Continuous Assessment Test, Quizzes, Assignment, Final Assessment Test			
Recommended by Board of Studies		21-02-2018	
Approved by Academic Council	No. 49	Date	15-03-2018



CLE6004	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	Nil	Syllabus version				
		1.1				
Course Objectives:						
<ol style="list-style-type: none"> 1. To impart broad knowledge in the area of repair and rehabilitation of structures 2. To understand about various causes of deterioration of structures 3. To obtain the knowledge about corrosion of structures 4. To understand the properties of repair materials 5. To know various repair techniques and strengthening methods 						
Expected Course Outcome:						
<p>Upon completion of this course, the student will be able to</p> <ol style="list-style-type: none"> 1. Explain the role of the maintenance engineer 2. Describe the causes of deterioration of concrete, steel, masonry and timber structures 3. Identify the effect of corrosion on structures 4. Explain the NDT techniques to assess the condition of the structures 5. Describe various properties and applications of repair materials 6. Explain the techniques for repairing 7. Discuss the Strengthening of distressed buildings 						
Module: 1	Introduction	5 hours				
Importance of maintenance - Types of maintenance - Decay of structures- Role of the Maintenance Engineer - Quality Assurance for concrete construction - Design and construction errors.						
Module: 2	Deterioration of Structures	6 hours				
Causes of deterioration of concrete, steel, masonry and timber structures - surface deterioration - efflorescence - Causes and preventive measures.						
Module: 3	Corrosion of Structures	6 hours				
Corrosion mechanism - Effects of cover thickness and cracking - Methods of corrosion protection – Inhibitors - Coatings - Cathodic protection for reinforcements.						
Module: 4	Inspection and Assessment of Distressed structures	6 hours				
Visual inspection – Non-destructive tests –Ultrasonic pulse velocity method – Rebound hammer technique– Pullout tests – Core test.						
Module: 5	Materials for Repair	6 hours				
Special concretes and mortar - Concrete chemicals - Special elements for accelerated strength gain - Expansive cement- Polymer concrete – Ferro cement, Fibre reinforced concrete - Fibre reinforced plastics.						
Module: 6	Techniques for Repair	6 hours				
Techniques for repairing of spalling and disintegration of structures - Grouting –Autogenous healing- Pre-packed concrete- Protective surface coating.						
Module:7	Strengthening of distressed buildings	6 hours				
Repairs to overcome low member strength – Deflection - Chemical disruption - Weathering wear - Fire leakage - Marine exposure- Use of FRP- NDT tests						
Module: 8	Contemporary issues	2 hours				



Total Lecture hours		45 hours	
Text Book(s)			
1.	Modi, P.I., Patel, C.N. (2016). Repair and Rehabilitation of Concrete Structures, PHI India, New Delhi.		
Reference Books			
1.	IABSE, (2010). Case Studies of Rehabilitation, Repair, Retrofitting, and Strengthening of Structures, Volume 12, Structural Engineering Documents (SED), Switserzland.		
2.	Varghese, P.C. (2014), Maintenance, Repair & Rehabilitation and Minor Works of Buildings, PHI India, New Delhi.		
3.	Bhattacharjee, J. (2017), Concrete Structures Repair Rehabilitation And Retrofitting, CBS Publishers & Distributors, New Delhi.		
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Final Assessment Test			
Recommended by Board of Studies		27.09.2017	
Approved by Academic Council		No. 47	Date 05-10-2017



CLE6008	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	NIL	Syllabus version				
		1.1				
Course Objectives:						
<ol style="list-style-type: none"> 1. To understand the concepts of EIA and also emphasis the role of engineers in EIA and Environmental impact factors. 2. To know the legislations to be used for enforcement of environmental acts and the role of public participation 3. To discuss the methods to be used in EIA and legal systems related to environmental management systems (EMS) (EIA, Environmental Audit (EA), Life cycle Assessment (LCA)) for cleaner production and sustainable development. 4. To know the impacts occurred to physical environment by the projects 5. To know the impacts occurred to biological environment by the projects 6. To know the impacts occurred to human resources by the projects 7. To draft a EIA for specific projects and understanding the mitigation and monitoring methods 8. To get exposed to practical experience for drafting a EIA through consultant/Government 						
Expected Course Outcome:						
<p>Upon completion of this course the student shall be able to</p> <ol style="list-style-type: none"> 1. Explain the philosophy and art of environmental management systems 2. Role of government in approving the projects and the laws to be enforced 3. Apply the mechanism of EIA for Project Appraisal, Decision making and Implementation 4. Suitable methods in handling the data collected during the EIA processes 5. Possible impacts that could occur for physical, biological and human resources by the project 6. A complete EIA report could be drafted 7. Work as a professional member of a team conducting environmental assessments and auditing, and LCA 8. To understand the difference between theory and practice for writing a EIA report 						
Module: 1	Environmental Impact Assessment (EIA)					6 hours
EIA for Environmental Engineers–Environmental Impact Statement – Environmental Appraisal–Environmental Impact Factors.						
Module: 2	EIA Legislation					6 hours
Criteria and Standards for Assessing Significant Impacts–Risk Assessment–Public Participation and Involvement.						
Module: 3	EIA Process and Methods					9 hours
Criteria for the Selection of EIA Methodology–Screening–Scoping–Predictive Models for Impact Assessment–Mitigation, Monitoring, Auditing, Evaluation of Alternatives and Decision Making–Methods of Strategic Environmental Assessment. Environmental management plan.						
Module: 4	Prediction and Assessment of Impacts on Physical Environment					6 hours
Geology –Soils – Minerals – Climate – Water Resources – Water Quality – Air Quality – Noise.						
Module: 5	Prediction and Assessment of Impacts on Biological Environment					5 hours



Terrestrial Ecosystems – Wetland Ecosystems – Aquatic Ecosystems – Threatened and Endangered Species.		
Module: 6	Prediction and Assessment of Impacts on Human Resources	6 hours
Demographics – Economics – Land Use – Infrastructure – Archaeological and Historic – Visual – safety.		
Module: 7	EIA Case Studies	5 hours
Environmental Impact of Industrial Development – Management Requirements for the Preparation of EIA for industrial projects – Preparation of EIA of Land Clearing Projects – Assessment of Impacts of Traffic and Transportation – EMP		
Module: 8	Contemporary Issues	2 hours
Total Lecture hours		45 hours
Text Book(s)		
1.	Larry W. Canter, (1996), Environmental Impact Assessment, 2 nd Edition, McGraw-Hill,	
2.	Judith Petts (Ed.), (2009), Handbook of Environmental Impact Assessment- Volume 1 & 2' authored by, Blackwell Science.	
References		
1.	Charles H. Eccleston, (2011), Environmental Impact Assessment: A Guide to Best Professional Practices, CRC Press.	
2.	Peter Morris and Riki Therivel, (2009), Methods of Environmental Impact Assessment' in: Volume 2 of Natural and Built Environment Series, 3rd Edition, Routledge	
3.	Y. Anjaneyulu and Valli Manickam, Environmental Impact Assessment Methodologies' 2 nd Edition, B.S. Publications.	
4.	Peter Wathern (Ed.) (2013), Environmental Impact Assessment: Theory and Practice, Routledge London	
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Final Assessment Test		
Recommended by Board of Studies		27.09.2017
Approved by Academic Council	No. 47	Date 05-10-2017



CLE6013	OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	Nil	Syllabus version				
		1.0				
Course Objectives:						
<ol style="list-style-type: none"> 1. Applying a very wide scholastic education to successfully lead, influence, and accomplish the safety goals and objectives of the industries. 2. Effectively communicating and collaborating inside a different work environment 3. Working in an ethical and professional ways inside the industry 						
Expected Course Outcome:						
Upon completion of this course, the student will be able to						
<ol style="list-style-type: none"> 1. Use techniques, skills, and modern scientific and technical tools necessary for professional practice of occupational safety and health; 2. Identify and solve occupational safety and health problems; 3. Understand professional and ethical responsibility in occupational safety and health; 4. Design and conduct survey/investigations, as well as to analyse and interpret data in the field of occupational safety and health; 5. Demonstrate knowledge of the contemporary issues surrounding occupational safety and health 						
Module: 1	Introduction to Safety	5 hours				
Occurrence of accident – sequence – injuries – occupational injuries – industrial accidents – key principles – OSH principles. Environmental management system (EMS)						
Module: 2	Motivating safety and health	6 hours				
Motivational environment – principles – self motivation – behavior based safety – Heinrich’s Domino concept – Benefits of lean and sustainability						
Module: 3	Identification and Analysis of hazards	6 hours				
Hazard identification – types – reporting system – audits – root cause analysis – job hazard analysis – risk versus cost. Life cycle analysis.						
Module: 4	Occupational injuries and illness	8 hours				
Bureau of labor statistics – occupational trauma death – injuries – injury and death cost – temperature extremes – ionizing radiation – noise induced hearing loss – vibrations – chemical hazards – flammable combustible liquids – biological monitoring						
Module: 5	Industrial hygiene and ergonomics	7 hours				
Occupational illness prevention – industrial modes of entry of contaminants – types of air contaminants – exposure monitoring – units of concentration – limits of exposure – ergonomic risk factors – physical work activities and conditions						
Module: 6	Intervention, control and prevention of accidents	6 hours				
Hazard prevention and control – elimination or substitution – awareness devices – personal protective equipment – safe operating procedures – fleet safety.						
Module: 7	OSHA compliance	5hours				
Standards – employer’s responsibilities – violations – medical and exposure records – employer liability – worker’s compensation						
Module: 8	Contemporary Issues	2 hours				
Total Lecture hours						45 hours



Text Book(s)			
1.	Industrial safety and health for technologist, engineers and managers, David L. Goetsch, 8 th Edition, Pearson Publishers, 2014.		
Reference Book			
2.	Handbook of environmental health and safety, Vol I & II, Herman Kooren, Michael Bisesi, Jaico Publishing House, 1999.		
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Final Assessment Test			
Recommended by Board of Studies		04-03-2016	
Approved by Academic Council	No. 40	Date	18-03-2016



CLE6022	URBAN PLANNING AND SUSTAINABILITY	L	T	P	J	C
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Pre-requisite	NIL	Syllabus version				
		1.1				
Course Objectives:						
<ol style="list-style-type: none"> 1. To make students taking this course be able to understand about the project formulation for urban sustainability 2. To be able to know the theories of urban planning 3. To understand the impact of a plan to the environment 4. To find effective methods of infrastructure planning 5. To identify areas where Smart infrastructure and smart cities can be incorporated. 						
Expected Course Outcome:						
<p>Upon completion of this course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Explain the aspects to be considered when planning a city 2. Appreciate the impact of a plan on the environment 3. Identify the factors that will by knowing existing theories of planning 4. Prevent delays in project approval because of knowledge of the requirements of appropriate institutional bodies 5. Relate various aspects of sustainable infrastructure and plan development 6. Gain understanding of the various factors that affect the urban structure and develop effective transportation systems 7. Understand requirements of smart city 8. Be aware of practice of industry 						
Module: 1	Introduction to City Planning	5 hours				
Overview of planning from prehistory to current - Industrialization and the transformation of Urban Space - Detailed case studies of planned cities - Introduction of Remote sensing, GIS and GPS in urban planning. Smart City Planning.						
Module: 2	Economy and Environment	8 hours				
Indian cities and challenges involved in planning -Urban Renewal and Suburbanization - Downtown Redevelopment - Planning for Disaster risk reduction - Energy and Sustainability - Global Sustainability Issues and Climate Change - Concepts of EIA and LCA.						
Module: 3	Planning Theories	5 hours				
Theory of city form: normative models –cosmic, machine, organic; Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory - Modes of planning -Land use and land value -Emerging Concepts and Environmental Planning.						
Module: 4	Institutional Mechanisms	5 hours				
Planning system in India and changes in institutional provisions over time - authorities and mechanisms for planning, implementation and evaluation - levels of hierarchy. Types of plans – master plans, development plans. Digital Data Integration with Sustainable Smart Cities.						
Module: 5	Infrastructure Planning	8 hours				
Critical issues in sustainable infrastructural planning- Concepts of basic needs, formation of objectives and standards - Data requirements for planning of urban networks and service - feasibility planning studies for structure, infrastructure systems. Technology for Sustainable Smart City Infrastructure. Recycling Technologies and Renewable energy.						
Module: 6	Evaluation of Urban Structure	4 hours				



Infrastructure and management -Sustainable Transportation systems and their types - design and operating characteristics - urban road hierarchy planning - criteria for road and junction improvements - arterial improvement techniques. Integrated inter-modal transport systems.			
Module: 7	Smart Cities and Sustainable Development		8 hours
Human development and sustainability - Rights of future generations -Climate Change and development - Leveraging recent technologies in enhancing urban living: internet of things (IoT) – Concept of smart cities.			
Module: 8	Contemporary issues		2 hours
Total Lecture hours			45 hours
Text Book(s)			
1.	Peter Hall, Mark Tewdwr-Jones. (2010), Urban and Regional Planning, Routledge		
Reference Books			
1.	Peter Hall (2014), Cities of Tomorrow, An Intellectual History of Urban Planning and Design Since 1880. 4th Edition, Wiley-Blackwell		
2.	Randall Crane and Rachel Weber (2015), The Oxford Handbook of Urban Planning, Oxford University Press.		
3.	Ian Bracken (2014), Urban Planning Methods, Research and Policy Analysis, Routledge.		
4.	Harry T. Dimitriou, Ralph Gakenheimer (2011), Urban Transport in the Developing World, A Handbook of Policy and Practice. Edward Elger Publishing, USA.		
5.	Joy Sen (2013), Sustainable Urban Planning, The Energy and Resources Institute (TERI), New Delhi, India.		
6.	Russ Lopez. (2012), The Built Environment and Public Health, Jossey-Bass, USA		
7.	Eddie N. Laboy-Nieves, Fred C. Schaffner, Ahmed Abdelhadi, Mattheus F.A. Goosen (2008), Environmental Management, Sustainable Development and Human Health, A Balkema Book, CRC Press.		
8.	Carol L. Stimmel. (2015), Building Smart Cities: Analytics, ICT, and Design Thinking, An Auerbach Book, CRC Press.		
Mode of Evaluation: Continuous Assessment Test, Quizzes, Assignments, Final Assessment Test			
Recommended by Board of Studies		27.09.2017	
Approved by Academic Council		No. 47	Date 05-10-2017