SYLLABUS

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

<table>
<tr><td colspan="2">Class</td><td>M.TECH.</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td colspan="2">Semester/Year</td><td>III/II</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td colspan="2">Subject Name</td><td colspan="5">Contract Law and Regulation</td></tr>
<tr><td colspan="2">Subject Code</td><td colspan="5">MCECT20S301</td></tr>
<tr><td rowspan="2">Paper</td><td>English</td><td colspan="5">English</td></tr>
<tr><td>Hindi</td><td colspan="5"></td></tr>
<tr><td colspan="2">Max. Marks</td><td colspan="5">100</td></tr>
</table>

Course Objectives:

1. To compare the law of torts and the law of contract in order to differentiate between the natures of these two types of civil wrongs.
2. To analyze the various definitions of ‘Contract’ in order to identify the best approach of understanding the subject.
3. To analyze the concepts associated with the classical contract law in order to evaluate their relevance.

Course outcomes:

At the end of the Subject, students will be able to:

CO1: Trace the evolution of the law of contract with the changing times in order to evaluate the role of equity in law.
CO2: Analyze the various doctrines in order to determine their relevance.
CO3: Study contract laws and regulations so that adequate knowledge on formulating.
CO4: Managing construction contracts is gained.
CO5: Apply the global business laws to current business environment.

Unit	Syllabus	Periods
UNIT-I	**Contract Agreements:** Functions of Contracts in engineering- Introduction to Contract agreements, Terms involved in Contract agreements - Elements of Contracts -Types of Contracts, Standard Contract Document - Conditions of Contract-Law of Torts.	**8**
UNIT-II	**Tendering Concepts:** Tendering Process - tender documents, requirements for tendering, Methods of inviting tenders-Evaluation of Tender from Technical, financial aspects, Two Cover System- Preparation of the Documentation.	**9**
UNIT-III	**Appointment of Arbitrator**: Earnest Money Deposit (EMD), Security deposits - Arbitrator- appointment of arbitrator-power and duties of arbitrator, dispute review board- Violations, Certificates, Forms, Schedules, Case study.	**11**
UNIT-IV	**Types Of Tax Involved In Construction:** Potential Contractual Problems, price variation clause, fine and Liquidated Damages, insurance income tax, sales tax, VAT, Legal requirements of planning, local government approval-Case study.	**13**
UNIT-V	**Labour Laws:** Indian Contracts Act - Labour laws , workmen compensation act , minimum wages Act , Child labour Act- Industrial	**14**

	dispute Act- Maternity benefit Act , Domestic emerging on misconduct.	

Text book:

1. John G. Betty., “Engineering Contracts”, McGrawHill, 2003.
2. Gajaria G.T., “Laws Relating to Building and Engineering Contracts in India”, McGrawHill, 2003.
3. M. Tripathi Private Ltd., Bombay, 1982 Tamilnadu PWD Code, 2006.
4. Jimmie Hinze, “Construction Contracts”, McGraw Hill, 2001.

Reference books:

1. Joseph T. Bockrath, “Contracts, the Legal Environment for Engineers and Architects”, McGraw Hill, 2000.
2. Lecture Notes, “Legal Aspects for Civil Engineers, Short Term Course organized by SRMEC”, 29th May to 4th June, 2002.
3. Oxley Rand Posicit, “Management Techniques applied to the Construction Industry”, Granda Publishing Ltd., 2000.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Class		M.TECH.	L	T	P	C
Semester/Year		III/II	3	0	0	3
Subject Name		Shoring Scaffolding and Formwork				
Subject Code		MCECT20S302				
Paper	English	English				
	Hindi					
Max. Marks		100				

Course Objectives:

1. Explain shoring and how it is accomplished.
2. Describe scaffolding and its different types and application.
3. Describe underpinning, when it is needed, and how it is done.

Course outcomes:

At the end of the Subject, students will be able to:

CO1: Bring about a thorough exposure to shoring, scaffolding.
CO2: Formwork procedures in construction practice by studying the materials, planning.
CO3: Design aspects and erection procedures.
CO4: Shoring and scaffolding are the most frequent temporary structures in building construction.
CO5: Produce a concrete member of the required shape, size and the desired finish.

Unit	Syllabus	Periods
UNIT-I	**Formwork Materials:** Lumber, Types, Finish, Sheathing ratio, Working stresses, Repetitive member stress, Plywood, Types and grades, Textured surfaces and strength, Reconstituted wood, Steel, Aluminum, Form lining materials, Hardware and fasteners, Nails in Plywood, Bolts, lag screws and connectors, Bolt loads. Tubular steel shores, patented shores Horizontal shores -Ellis shores -Dayton sure grip and Baker Roof shores, Safeway Symons shores-Dead shore -Raking and Flying shores.	8
UNIT-II	**Design Considerations:** Design considerations, Live loads and Wind pressure, Concrete pressure on form work, Concrete density, Height of discharge, Temperature, Rate of Placing, Consistency of concrete, Vibration, Hydrostatic pressure and pressure distribution, Examples, Adjustment for nonstandard conditions, Basic simplification, Beam forms, Slab forms, Column forms, Wall forms, Allowable stresses, Check for deflection, bending and lateral stability, Examples.	9
UNIT-III	**Overall Planning:** Overall Planning -Detailed planning - Standard units - Corner units, Schedule - Planning at Tender stage, Development of basic system, Planning for maximum reuse, Planning examples, Site layout plan,	11

	Crane arrangements, Recheck plan details, Planning for safety, Transporting plant, Wales and ties, Vertical transportable form work. Simple wood stresses, Slenderness ratio, Allowable load, Site Preparation, Size and spacing, Steel Tower Frames, Safety practices.	
UNIT-IV	**Formwork For Different Systems:** Location of job mill, Storage, Equipment, Form for Wall footings, Column footings, Slab on grade and paving work, Highway and Airport paving, External vibration, Prefabricated panel systems, Giant forms, Curved wall forms, Tolerance for walls, Erections Practices, Column heads, Beam or girder forms, Suspended forms, Suggested Tolerances, Concrete Joint construction, Flying system forms. Causes of failures, Case studies, Finish of exposed concrete, Design deficiencies, Safety factors, Stripping sequence, Reshore installation, Advantages of reshoring.	**13**
UNIT-V	**Design Considerations For Different Structures**: Shell forms, Design considerations, Loads, Building forms, Strength requirements, Tunnel forming components, Curb and gutter forms, Invert forms, Arch forms, Concrete placement methods, Cut and cover construction, Tolerances, Slip forms, Principles, Types, Advantages, Functions of various components, Planning, Safety in slip forms, Special structures built with slip form technique, Codal provisions, Types of scaffolds, Putlog and Independent scaffold, Single pole scaffolds, Fixing ties, Spacing of ties - bracing, knots safety net, General safety requirements, Gantry and system scaffolds, Shuttering for Precast members and continuous casting forms.	**14**

Text book:

1. Robert L. Peurifoy and Garold D. Oberlender, “Formwork for Concrete Structures”, McGraw, Hill, 2006.
2. Hurd. M.K., “Formwork for Concrete”, Special Publication No.4 Fifth Edition American Concrete Institute, Detroit, 2003.
3. Austin. C.K., “Formwork for Concrete”, Cleaver, Hume Press ltd., London, 2006.

Reference books:

1. Tudor Dinescu and Constantin Radulescu, “Slip Form Techniques”, Abacus Press Tum Bridge Wells, Kent, 2002.
2. “Guide for Concrete Formwork”, American Concrete Institute, Box No. 9150, Michigan 48219.
3. “Safety Requirements for Scaffolding”, American National Standards Institute. Broadway, New York, 10018.

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Class		**M.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**0**	**0**	**3**
Subject Name		**Energy Conservation Techniques in Building Construction**				
Subject Code		**MCECT20S303**				
Paper	**English**	**English**				
	Hindi					
Max. Marks		**100**				

Course Objectives:
1. Energy conservation in buildings is the decrease in the use of energy for its construction.
2. Energy conservation in for its running and maintenance, proper design and orientation.
3. Use of climatic conditions including passive and active features, use of more efficient.

Course outcomes:
At the end of the Subject, students will be able to:
CO1: Bring an about exposure to different sources and production systems of energy.
CO2: Apply the effective management adopting appropriate design methodology in construction.
CO3: Apply the thermal performance of existing and new buildings can be upgraded, and hence energy saved.
CO4: Apply various 'indirect' methods, For example, increase of insulation, improvement upon ventilation.
CO5: Recover sensible and latent heat contained in exhaust air, modifications of occupants' behaviour, introduction.

Unit	Syllabus	Periods
UNIT-I	**Fundamentals Of Energy:** Fundamentals of energy, Energy Production Systems, Heating. Ventilating and Air. conditioning ,Solar Energy and Conservation ,Energy Economic Analysis ,Energy conservation and audits, Domestic energy consumption –savings, challenges – primary energy use In buildings, Residential. Commercial, Institutional and public. Buildings.	**8**
UNIT-II	**Energy And Resource Conservation:** Energy and resource conservation. Design of green buildings ,Evaluation tools for building energy ,Embodied and operating energy .Peak demand, Comfort and indoor air quality ,Visual and acoustical quality ,Land, water and materials –Airborne emissions and waste management.	**9**
UNIT-III	**Design Consideration:** Natural building design consideration. Energy efficient design strategies -Contextual factor -Longevity and process Assessment -Renewable Energy Sources and design - advanced building Technologies. Smart buildings –Economics and cost analysis.	**11**

UNIT-IV	**Energy In Building Design:** Energy in building design- Energy efficient and environment friendly building -Thermal phenomena.-thermal comfort- Indoor Air quality -Climate, sun and solar radiation. Psychometrics -passive heating and cooling systems- Energy Analysis. Active HVAC- systems - Preliminary Investigation -Goals and policies -Energy audit -Types of Energy audit -Analysis of results –Energy flow diagram -Energy consumption /Unit Production- identification of wastage ,Priority of conservative measures ,Maintenance of energy management programme.	**13**
UNIT-V	**Energy Management**: Energy management of electrical equipment, Improvement of power factor, Management of maximum demand, Energy savings in pumps, Fans. compressed air systems ,Energy savings In Lighting systems, Air conditioning systems, Applications, Facility operation and maintenance, Facility modifications, Energy recovery dehumidifier, Waste heat recovery. Steam plants and distribution systems, Improvement of boiler efficiencies, Frequency of blow down, Steam leakage, steam Flash and condensation.	**14**

Text book:

1.Moore F., “Environmental Control system”, Mc Graw Hill, Inc. 2004.

Reference books:

1. Brown, GZ Sun, “Wind and Light: Architectural design strategies”, John Wiley 2005.
2. Cook. J Award –“Winning passive Solar Design”, Mc,Graw Hill- 2004.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Class		**M.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**0**	**0**	**3**
Subject Name		**BUSINESS ANALYTICS**				
Subject Code		**MCECT20S304**				
Paper	**English**	**English**				
	Hindi					
Max. Marks		**100**				

Course Objectives:

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques.
3. Understand relationships between the underlying business processes of an organization.

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

CO1: Demonstrate knowledge of data analytics.
CO2: Demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO3: Demonstrate the ability to use technical skills in predicative.
CO4: Support business decision-making.
CO5: Demonstrate the ability to translate data into clear, actionable insights.

Unit	Syllabus	Periods
UNIT-I	Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.	**8**
UNIT-II	Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	**9**
UNIT-III	Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	**11**

UNIT-IV	Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	**13**
UNIT-V	Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	**14**

Text Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, Pearsons Education.

Reference Books:

1. H. G. Stoll, "Least cost Electricity Utility Planning", Wiley Inter science Publication, USA, 1989.
2. I.J. Nagarath and D. P. Kothari, .Modern Power System Engineering., Tata McGraw Hill publishers, New Delhi, 1995.
3. IEEE Bronze Book- "Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities", IEEE Inc., USA.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Class		**M.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**0**	**0**	**3**
Subject Name		**Industrial Safety**				
Subject Code		**MCECT20S305**				
Paper	**English**	**English**				
	Hindi					
Max. Marks		**100**				

Course Objectives:

1. Industrial safety is needed to check all the possible chances of accidents for preventing loss of life and permanent disability of any industrial employee, any damage to machine and material.
2. It is needed to eliminate accidents causing work stoppage and production loss.
3. It is needed to reduce workman’s compensation, insurance rate, and all the cost of accidents.

Course Outcomes:

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

CO1: The safety and productivity of people, machines, and processes is a key element of any sustainable business.

CO2: Industrial safety systems have been used for many years to perform safety functions in the manufacturing industries.

CO3: Safety is best achieved by inherently safe process design, Protection layer systems such as sensors, alarms, and personal protection equipment.

CO4: Apply standard safety procedures in an industrial environment.

CO5: These may be combined with protective systems to address any residual identified and counter risk.

Unit	Syllabus	Periods
UNIT-I	**Industrial safety:** Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	**8**
UNIT-II	**Fundamentals of maintenance engineering:** Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	**9**
UNIT-III	**Wear and Corrosion and their prevention:** Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication	**11**

	methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	
UNIT-IV	**Fault tracing:** Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, Electrical motors, Types of faults in machine tools and their general causes.	**13**
UNIT-V	**Periodic and preventive maintenance:** Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.	**14**

Text Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:

1. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Class		**M.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**0**	**0**	**3**
Subject Name		**Operation Research**				
Subject Code		**MCECT20S306**				
Paper	**English**	**English**				
	Hindi					
Max. Marks		**100**				

Course objective:

1. Understand the role and application of PERT/CPM for project scheduling.
2. Know how to compute the critical path and the project completion time. Know how to convert optimistic.
3. Most probable and pessimistic time estimates into expected activity time estimates.

Course outcomes:

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

CO1: Apply the dynamic programming to solve problems of discreet and continuous variables.
CO2: Apply the concept of non-linear programming.
CO3: Carry out sensitivity analysis and to model the real-world problem and simulate it.
CO4: Understand the importance of ground improvement techniques in civil engineering construction activities.
CO5: Reinforced wall design using steel strip or geo-reinforcement.

Unit	Syllabus	Periods
UNIT-I	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.	**8**
UNIT-II	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.	**9**
UNIT-III	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.	**11**
UNIT-IV	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	**13**
UNIT-V	Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.	**14**

Text books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

References books:

1. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008.
2. Hitler Libermann Operations Research: McGraw Hill Pub., 2009.
3. Pannerselvam, Operations Research: Prentice Hall of India, 2010.
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Class		**M.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**0**	**0**	**20**	**10**
Subject Name		**Dissertation I**				
Subject Code		**MCECT20S307**				
Paper	**English**	**English**				
	Hindi					
Max. Marks		**250**				

Course Objectives:
At the end of the course the students should demonstrate skills related to performing a group project activity. The students should be able to undertake and execute a major project.

Course outcomes:
At the end of the Subject, students will be able to:
CO1: Identify structural engineering problems reviewing available literature.
CO2: Identify appropriate techniques to analyze complex structural systems.
CO3: Apply engineering and management principles through efficient and ling of project.

Contents	Periods
Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals ‘contribution. Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.	**20**

SEMESTER - IV

SYLLABUS

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

<table>
<tr><td>Class</td><td></td><td>M.TECH.</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>Semester/Year</td><td></td><td>IV/II</td><td>0</td><td>0</td><td>32</td><td>16</td></tr>
<tr><td colspan="2">Subject Name</td><td colspan="5">Dissertation II</td></tr>
<tr><td colspan="2">Subject Code</td><td colspan="5">MCECT20S401</td></tr>
<tr><td rowspan="2">Paper</td><td>English</td><td colspan="5">English</td></tr>
<tr><td>Hindi</td><td colspan="5"></td></tr>
<tr><td colspan="2">Max. Marks</td><td colspan="5">500</td></tr>
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<table>
<tr><td colspan="2">Course Objectives:
At the end of the course the students should demonstrate skills related to performing a group project activity. The students should be able to undertake and execute a major project.</td></tr>
<tr><td colspan="2">Course outcomes:
At the end of the Subject, students will be able to:
CO1 Solve complex structural problems by applying appropriate techniques and tools.
CO2: Exhibit good communication skill to the engineering community and society.
CO3: Demonstrate professional ethics and work culture.</td></tr>
<tr><td>Contents</td><td>Periods</td></tr>
<tr><td>Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals ‘contribution.

Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.</td><td>32</td></tr>
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