Department of Civil Engineering

List of programs in School of Engineering and their POs & PSOs

1. **M.Tech CE&M**
   School of Engineering and Technology provides M. Tech. degrees in the following programmes:

PROGRAM OUTCOMES OF M. TECH CE&M

PO1. Engineering knowledge: Graduates can apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to Civil Engineering related problems.

PO2. Problem analysis: An ability to identify, formulate, review research literature, and analyze Civil engineering problems reaching substantiated conclusions using principles of mathematics and engineering sciences.

PO3. Design/development of solutions: An ability to plan, analyse, design and implement engineering problems and design system components or processes to meet the specified needs.

PO5. Conduct investigations of complex problems: An ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO6. Modern tool usage:An ability to apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

M. TECH. CE&M

Program Specific Outcomes:

PSO-1: Demonstrate the thorough knowledge of the profession and implement it for the enrichment of the quality of life in society.

PSO-2: Demonstrate design skills by using software and technical support.

PSO-3: Demonstrate the ability to undertake research projects in various fields of civil engineering using software and experimental techniques.

PSO-4: Demonstrate ability for teamwork and lifelong learning.

Paper Code	**CE 501**
Paper Title	**Statistical Methods and Queuing Theory**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	To apply all the discrete distributions for analyzing the data.
CO 2	To use various continuous distributions whenever necessary.
CO 3	To describe the practical applications of truncated distribution.
CO 4	To apply order statistics for distribution theory.

Paper Code	**CE 503**
Paper Title	**Modern Construction Materials**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	Understand various conventional construction materials, properties and their uses
CO 2	Describe various latest and modern construction materials, properties and their uses
CO 3	Understand the general construction processes and their sequence
CO 4	Understand the various techniques which are useful for the substructure construction
CO5	Understand the various techniques which are useful for the superstructure construction

Paper Code	**CE 505**
Paper Title	**Project Planning & Construction Management**
Course outcomes	**Course Learning Outcomes are as listed below:**

CO 1	Apply fundamentals of management to utilize functions of management in construction. Like Demonstrate leadership qualities by implementing construction project processes with control.
CO 2	Implement planning strategies and policies.
CO 3	Carry out organization and execute work in group in an organization.

Paper Code	**CE 507**
Paper Title	**Construction equipment**
Course outcomes	**Course Learning Outcomes are as listed below:**
CO 1	On completion of this course the students will have the knowledge of construction equipment's practices and techniques to be used in the field.
CO 2	Be able to apply theoretical and practical aspects of project management techniques to achieve project goals.
CO 3	Become familiar with construction equipment and their capabilities
CO 4	Learn how to best utilize construction equipment on site work and heavy civil projects
CO 5	Properly select heavy equipment based on applications, utilization, productivity, and other factors.

Paper Code	CE 502
Paper Title	Project formulation & appraisal
Course outcomes	Course Learning Outcomes are as listed below:
CO 1	To make them understand the concepts of Project Management for planning to execution of projects.
CO 2	To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
CO 3	To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
CO 4	Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Paper Code	CE 504
Paper Title	Contract Laws and Regulations
Course outcomes	Course Learning Outcomes are as listed below:
CO 1	Explain the basic elements of forming an enforceable contract and agreement.
CO 2	Classify various negotiable instruments and reason of its dishonor.

CO 3	Enumerate the types of companies its management and its rules of corporate governance.

Paper Code	**CE 504**
Paper Title	**Construction Planning, Scheduling and Control**
Course outcomes	Upon successful completion students should be able to:
CO 1	Assemble and use various construction schedules to manage a construction project.
CO 2	Prioritize scheduled tasks in order to streamline planning strategies, shorten overall construction schedules, and reduce costs.
CO 3	Communicate effectively with team members by recognizing and utilizing best practices for planning and scheduling of construction tasks.

Paper Code	**CE 508**
Paper Title	Computer Applications in Construction Engineering

Course outcomes	Upon successful completion students should be able to:
CO 1	To understand the Various mix design standers of concrete are known (IS, ACI &BS) Characteristics of various concretes are identified.
CO 2	To clearly explain the NDT on hardened concrete-UPV, Rebound hammer and core test.
CO 3	To clearly explain the Properties of hardened concrete in Permeability tests
CO 4	To understand the Design of a simple equipment information system for a construction project.
CO 3	To clearly explain the Simulation models for project risk analysis

Paper Code	CE 601
Paper Title	Construction of pavement
Course outcomes	Upon successful completion students should be able to:
CO 1	Obtain a basic Knowledge of the fundamental issues in pavement management system.
CO 2	Deduce the summarization of structural and functional evaluation of pavements.
CO 3	Learning the types of distress and surveys done on the pavement

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Paper Code	**CE 603**
Paper Title	Shoring, Scaffolding and Formwork
Course outcomes	Practice by studying the materials, planning and design aspects and erection procedures. To bring about a thorough exposure to shoring, scaffolding and formwork procedures in construction.
CO 1	Study the materials associated with formwork.
CO 2	Study the design aspects of formwork under various requirements.
CO 3	Know the design of forms and shores
CO 4	Study the planning and erection aspects of form work for buildings.
CO 5	Understand few other special types of forms.

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Accredited by NAAC with 'A' Grade

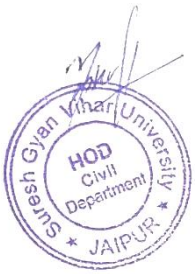
Department of Civil Engineering

SYLLABI

(Session 2021-22)

Of

M.Tech - Construction Engineering & Management



(Civil engineering)

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech CE&M.

Session 2021-22

I YEAR **I SEM**

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S.NO	Course Code	Course Name	Credit	Contact Hours/Week			Exam Hours	Weightage (%)	
				L	T	P		CE	ESE
A. THEORY PART									
1	CE 501	Statistical Methods and Queuing Theory	4	3	1	0	3	40	60
2	CE503	Modern Construction Materials	4	3	1	0	3	40	60
3	EM 501	Employability skills	1	1	0	0	3	60	40
4	CE 505	Project Planning & Construction Management	3	3	-	-	3	40	60
5	CE 507	CONSTRUCTION EQUIPMENT	4	3	1	0	3	40	60
6	CE 551	Microsoft office Project (MSP)	3	0	0	3		60	40
C. DISCIPLINE & CO-CURRICULAR ACTIVITES									
7	PC 501	Proficiency in co-curricular activities	1	-	-	-	-	100	
		Total	**22**	**13**	**3**	**-**	**-**	**-**	**-**
		Grand total		**16**					

SURESH GYAN VIHAR UNIVERSITY

Department Of Civil Engineering

Teaching and Examination Scheme for M.Tech CE&M.

Session 2021-22

I YEAR **II SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T	P		CE	ESE
		A: Theory Papers							
1	CE 502	Project formulation & appraisal	3	3	-	-	3	40	60
2	CE 504	Contract Laws and Regulations	3	3	-	-	3	40	60
3	CE 506	Construction Planning, Scheduling and Control	3	3	-	-	3	40	60
4	CE 508	Computer Applications in Construction Engineering and Planning	3	3	-	-	3	40	60
5	HS 502	Soft skills Training II	1	1	0	0	3	100	
		B. Practical's And Sessionals							
7	CE 552	Practical Training (4 Weeks)	3	-	-	-	3	60	40
8	CE 554	Advanced Construction Engineering and Computing Techniques Laboratory	1	-	-	2	3	60	40
9	CE 556	SEMINAR	1	-	-	3	3	60	40
10	PC 502	Proficiency in co-curricular activities	1	-	-	-	-	100	-
		Total	**19**	**13**	**-**	**5**			
		Grand total		**18**					

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II YEAR **III SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weight age (%)	
				L	T	P		CE	ESE
		A: Theory Papers							
1	CE 601	Construction of pavement	4	3	1	-	3	40	60
2	CE 603	Shoring, Scaffolding and Formwork	3	3	-	-	3	40	60
		B. Practical's And Sessionals							
3	CE 661	Practical Training (4 Weeks)	3	-	-	-	3	40	60
4	CE 663	SEMINAR	3	-	-	5	-	60	40
5	PC 601	Proficiency in co-curricular activities	1	-	-	-	-	100	-
		Total	**14**	**6**	**1**	**5**			
		Grand total		**12**					

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II YEAR **IV SEM**

S. No.	Course Code	Course Name	Credits	Contact Hrs/ Wk.			Exam. Hours	Weightage (%)	
				L	T	P		CE	ESE
		A: Practical And Sessionals							
1	DI 602	DISSERTATION	16	-	-	4	3	60	40
		Total	**16**	**0**	**0**	**4**			
		Grand total	**16**						

CE 501 STATISTICAL METHODS AND QUEUING THEORY C(L,T,P) = 4 (3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**One dimensional random variable** - Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.	7
II	**Estimation theory -** Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.	7
III	**Testing of hypotheses -** Sampling distributions - Type I and Type II errors - Tests based on Normal, t, χ^2 and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.	7
IV	**Design of experiments -** Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.	**7**
V	**Queueing models -** Poisson Process – Markovian queues – Single and Multi Server Models – Little's formula Machine InterferenceModel – Steady State analysis – Self Service queue.	8
	Total	**36**

Reference Books:

1. Advances in Queuing: Theory, Methods, and Open Problems by Jewgeni H. Dshalalow
2. Applied Probability and Queues by Soeren Asmussen
3. Fundamentals of Queuing Theory, Solutions Manual by Donald Gross, John F. Shortle, James M. Thompson, and Carl M. Harris.

CE 503 MODERN CONSTRUCTION MATERIALS C (L,T,P) = 4 (3,1,0)

UNIT	COURSE CONTENTS	Hours
I	**Special concretes -** Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete	7
II	**Metals -** Steels - New Alloy Steels – Aluminum and its Products –Coatings to reinforcement – Applications.	8
III	**Composites -** Plastics –Reinforced Polymers – FRP – Applications	8
IV	**Other materials -** Water Proofing Compounds – Non-weathering Materials – Flooring and Facade Materials	**7**
V	**Smart and intelligent materials -** Smart and Intelligent Materials for intelligent buildings - Special features	**7**
	Total	**37**

Reference Books:

1. Making the Modern World: Materials and Dematerialization by By Vaclav Smil
2. Concrete for the Modern Age: Developments in Materials and Processes - Atef Badr, Charles Fentiman, Professor Michael Grantham, Raman Mangabhai

HS 501 **SOFT SKILLS TRAININIG I** **C (L, T, P) = 1 (1,1,0)**

Unit	Course Contents	Hours
I	Spoken English – PICTURE (p=pronunciation, I=inflection, C=Clarity & courtesy, T=Tone, U=Understanding and feedback, R=Rate of speech and Repeatition, E=Emphasis), Body Language Training, Active Listening	8
II	Introduction to business terms, Economic Times Reading, Communication skills	8
III	Johari Window Training, Firo-B Training, Relationship Management	10
IV	Role Plays, Conflict Management	7
V	I'm OK U'r OK Training, Time Management Training	6
	Total	39

CE 505 PROJECT PLANNING & CONSTRUCTION MANAGEMENT C (L,T,P) = 3 (3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**Financial evaluation of projects and project planning**: Capital investment proposals, criterions to judge the worth whileness of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure. Categories of construction projects, objectives, project development process, Functions of project management, Project management organization and staffing, Stages and steps involved in project planning, Plan development process, objectives of construction project management.	8
II	**Project scheduling**: Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis	7
III	**Project cost and time control**: Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope, Process of crashing of activities, determination of the optimum duration of a project, updating of project networks, resources allocation	8
IV	**Contract management**: Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration	7
V	**Safety and other aspects of construction management**: Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, frame work, benefits of computerized information system. Environmental and social aspects of various types of construction projects	8
	Total	**38**

Reference Books:

1. Construction Project Planning and Scheduling By Charles Patrick
2. Project Management for Engineering and Construction by Garold D. Oberlender
3. Construction Process Planning and Management by By Sidney M Levy

CE 507 **CONSTRUCTION EQUIPMENT** **C (L,T,P) 4(3,1,0)**

UNIT	COURSE CONTENTS	Hours
I	**Construction equipment management** - Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment - Depreciation Analysis – Safety Management	7
II	**Equipment for earthwork** - Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers	7
III	**Other construction equipments** - Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment –Equipment for Demolition	7
IV	**Materials handling equipment** - Forklifts and related equipment - Portable Material Bins – Conveyors - Hauling Equipment	7
V	**Equipment for production of aggregate and concreting** - Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment – Transporters	8
	Total	**36**

Reference Books:

1. Construction Equipment - James Emerson Russell
2. Construction Equipment Management - John Schaufelberger
3. Construction Equipment Guide By David A. Day, Neal B. H. Benjamin

CE 551 **Microsoft Project** **C (L,T,P) 3 (0,0,3)**

COURSE CONTENTS	**Hours**
Project Scheduling	**3**
Project Work Breakdown Process	**3**
Project Work Scheduling	**3**
CPM	**3**
Time Cost Trade-Off Process	**3**
Process Of Crashing Of Activities	**3**
Determination Of The Optimum Duration	**3**
Resources Allocation	**3**
Label Of Work	**3**
Progress Report Of The Work	**3**
Introduction of all features	**3**

CE 502 PROJECT FORMULATION & APPRAISAL C (L,T,P) = 3(3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**Sub structure construction -** Box jacking - pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - piling techniques - driving well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - laying operations for built up offshore system - shoring for deep cutting - large reservoir construction - well points - dewatering and stand by plant equipment for underground open excavation	8
II	**Super structure construction for buildings -** Vacuum dewatering of concrete flooring – concrete paving technology – techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – launching techniques – suspended form work – erection techniques of tall structures, large span structures – launching techniques for heavy decks – insituprestressing in high rise structures, aerial transporting handling erecting lightweight components on tall structures	8
III	**Construction of special structures -** Erection of lattice towers and rigging of transmission line structures – construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges – launching and pushing of box decks – Advanced construction techniques for offshore structures – construction sequence and methods in domes and prestress domes – support structure for heavy equipment and conveyor and machinery in heavy industries – erection of articulated structures, braced domes and space decks	8
IV	**Rehabilitation techniques -** Mud jacking grout through slab foundation - micropiling for strengthening floor and shallow profile - pipeline laying - protecting sheet piles, screw anchors - sub grade water proofing, underpinning, crack stabilization techniques	7
V	**Demolition -** Advanced techniques and sequence in demolition and dismantling	7
	Total	**38**

Reference Books:

1. Project appraisal and financing by Ambrish Gupta.
1. Project Formulation in Developing Countries by P. K. Mattoo
2. Project Management: Principles and Techniques By B.B. Goel

CE 504 **CONTRACT LAWS AND REGULATIONS** **C (L,T,P) = 3 (3,0,0)**

UNIT	COURSE CONTENTS	Hours
I	**Construction contracts -** Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts	8
II	**Tenders -** 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	7
III	**Arbitration -** Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs	7
IV	**Legal requirements -** Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – 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	7
V	**Labour regulations -** Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws	7

Reference Books:

1. Regulatory Competition in Contract Law and Dispute Resolution edited by Horst Eidenmüller
2. Contract and Regulation: A Handbook on New Methods of Law Making in Private Law
3. Labour and industrial laws by P.K. Padhi

CE 506 CONSTRUCTION PLANNING, SCHEDULING AND CONTROL C (L,T,P) = 3 (3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**Construction planning** - Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems	7
II	**Scheduling procedures and techniques -** Construction Schedules - Critical Path Method – Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Node and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process.	8
III	**Cost control, monitoring and accounting -** The Cost Control Problem - The Project Budget - Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts - Control of Project Cash Flows - Schedule Control - Schedule and Budget Updates - Relating Cost and Schedule Information	7
IV	**Quality control and safety during construction -** Quality and Safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality Control - Quality Control by Statistical Methods - Statistical Quality Control with Sampling by Attributes - Statistical Quality Control with Sampling by Variables – Safety	8
V	**Organization and use of project information -** Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use of Information - Organizing Information in Databases - Relational Model of Databases - Other Conceptual Models of Databases - Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow	8
	Total	**38**

Reference Books:

1. Project Planning, Scheduling, and Control in Construction: An Encyclopedia By Calin M. Popescu, Chotchai Charoenngam
2. Location-Based Management for Construction: Planning, scheduling and control By Russell Kenley, Olli Seppäne
3. Construction Project Management By K. K. Chitkara

CE508 COMPUTER APPLICATIONS IN CONSTRUCTION ENGINEERING AND PLANNING C(L,T,P)=3(3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**Introduction -** Introduction to System Hardware – Languages – Feasibility study and analysis – procurement, training, implementation and system management – procedural language - developing application with spread sheet -developing application with files and database software	8
II	**Optimization techniques -** Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications	7
III	**Inventory models -** Deterministic and Probabilistic Inventory Models - Software applications	7
IV	**Scheduling application -** PERT and CPM - Advanced planning and scheduling concepts – Computer applications – case study	7
V	**Other problems -** Estimating – project planning and scheduling- accounting and cost engineering Enterprises Introduction to ERP systems - operations simulation	7
	Total	**36**

Reference Books:

1. Computer applications in construction by Boyd C. Paulson
2. Computer Integrated Planning and Design for Construction By Arkady Retik, David Langford, D. A. Langford.
3. Construction Project Planning and Scheduling By Charles Patrick

HS 502 SOFT SKILLS TRAININIG II C (L, T, P) = 1(1,0,0)

Unit	Course Contents	Hours
I	Making impact making business presentations	6
II	Team Management and Collaborative Work Culture	8
III	Training in Anchoring and Public Speaking	6
IV	Emotional Intelligence Training	7
V	Business Games, Business Etiquettes	10
	Total	37

CE 554 Advanced Construction Engineering and Computing Techniques Laboratory C (L, T, P) = 1 (0,0,2)

S.No.	List of Experiments	Hours
	(A) ADVANCED CONSTRUCTION ENGINEERING LABORATORY	
1	Flow Characteristics of Self Compacting concrete	
2	Effect of minerals and chemical admixtures in concrete at fresh and hardened state with relevance to workability, strength and durability.	
3	NDT on hardened concrete - UPV, Rebound hammer and core test.	
4	Permeability tests on hardened concrete	
5	Mix design of concrete as per IS, ACI & BS methods for high performance concrete.	
	LIST OF Equipments requirements:	
1	Concrete making equipments	
2	Equipments for self- compacting concrete.	
3	Workability and slump equipments for HPC & SCC	
4	Equipments for compression testing with very high precision with automated graph	
5	NDT equipments - UPV, rebound hammer, core cutting machine (electrically operated)	
6	Permeability apparatus	
7	Oven (Range 0 to 600 degree C)	
	(B) ADVANCED COMPUTING TECHNIQUES LABORATORY	
1	Quantity takeoff, Preparation and delivery of the bid or proposal of an engineering construction project.	
2	Design of a simple equipment information system for a construction project.	
3	Scheduling of a small construction project using Primavera scheduling systems including reports and tracking.	
4	Scheduling of a small construction project using tools like MS project scheduling systems including reports and tracking.	
	Simulation models for project risk analysis	
	LIST OF Equipments / SOFTWARES / TOOLS requirements	
1	MS OFFICE	
2	QE PRO	
3	MS OFFICE SUIT	
4	PRIMAVERA POWER USER	
5	PRIMAVERA CONTRACTOR STANDARD PERT MASTER	

CE 601 **CONSTRUCTION OF PAVEMENT** **C (L,T,P) = 4 (3,1,0)**

UNIT	COURSE CONTENTS	Hours
I	**Road making materials for flexible and rigid pavements -** Classification, testing and applications of road making aggregates – Road binders – Bitumen – Cement	7
II	**Properties of bituminous mixtures -** Resistance of bituminous mixtures to permanent deformation – Flexibility and brittleness – Commo mechanical tests – Permeability characteristics – Weathering of bituminous road surfacing – Adhesion of bituminous binders to road aggregates – Effect of aggregate size in bituminous courses – Temperature susceptibility of bituminous courses – Design of bituminous mixes	8
III	**Properties of pavement quality concrete mixures and construction practice** Properties of fresh and hardened concrete – laboratory tests – Design of concrete mixes for Pavement Quality Concrete. Construction of various layers in rigid and flexible pavements – Quality assurance during construction – sampling and analysis	8
IV	**Machineries** - Road making machineries – Road formation, bituminous constructions - Road surface evaluation	7
V	**Latest advancements -** Methods to improve bitumen quality – Rheological and chemical additives – Polymer modified bitumen – Super pave concepts – Recycling of bituminous courses – Smart materials for cement concrete pavement – Use of admixtures and fibres	7
	Total	**37**

Reference Books:

1. Concrete Pavement Design, Construction, and Performance, Second Edition By Norbert J. Delatte.
2. Highway Engineering: Pavements, Materials and Control of Quality By Athanassios Nikolaides Strength Of Material-B.C. Punmia
3. Asphalt Mix Design and Construction: Past, Present, and Future by K. Wayne Lee, Kamyar C. Mahboub

CE 603 SHORING, SCAFFOLDING AND FORMWORK C (L,T,P) = 3 (3,0,0)

UNIT	COURSE CONTENTS	Hours
I	**Planning and site equipment & plant for form work** - At Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms.Overall Planning – detail planning – Standard units – Corner units – Schedule for column formwork – Formwork elements – Planning Crane arrangements – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales and ties – scaffold frames from accessories – Vertical transport table form work	7
II	**Form materials -** Lumber – Types – Finish – Sheathing boards 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 Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic pressure and pressure distribution – Examples – Vertical loads - Uplift on shores – Adjustment for non standard conditions	7
III	**Design of forms and shores -** Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam forms – Ties, Anchors and Hangers – Column forms – Examples in each. Simple wood stresses – Slenderness ratio – Allowable load – Tubular steel shores patented shores – Site Preparation, Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multistories – More concentrated shore loads T- heads – Tow Tier wood shores – Ellis shores – Dayton sure grip and Baker Roofs shores – Safeway Symons shores – Beaver – advance shores Dead shore – Raking and Flying shores.	8
IV	**Formwork for buildings -** Location of job mill – Storage – Equipment – Footings – Wall footings – Column footings Sloped footing forms – Curb and gutter forms – Wall forms – Prefabricated panel systems – Giant forms curved wall forms – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Concrete joint construction – Flying system forms. Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping – Errors in design – Failure to follow codes – How formwork affects concretes quality – ACI – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – Advantages of reshoring.	8
V	**Forms for domes and tunnels, slip forms and safety practices for scaffolds -** Hemispherical, Parabolic, Translational typical barrel vaults, Hyperbolic Folded plates – Shell form design considerations loads – Inserts , Anchors bolts – Building the forms- Placing concrete – Form removed – Strength requirements – Tunnel forming components – Curb forms invert forms – Arch forms – Concrete placement methods – Cut and cover construction – Tolerances – Form construction – Shafts. **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 – Codal provisions - Types of scaffolds – Putlog and independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties plan – bracing – knots – safety net – General safety requirements – precautions against particular hazards – Truss suspended – Gantry and system scaffolds.	8
	Total	**38**

Reference Books:

1. Guide to Scaffolding Erection and Dismantling Procedures by Scaffolding, Shoring & Forming Institute.
2. Formwork for Concrete By Mary Krumboltz Hurd