Regulation 2018		Semester I / II	Total 3ours			75
Category	Course Code	Course Name	3ours / Week			C
			L	T	P	
S	18MES102J	BASIC CIVIL AND MECHANICAL ENGINEERING (CIVIL)	3	0	2	4

Prerequisite Course (s)

Nil

Course Objective (s):

- Select building materials and identify the components of a building
- Identify the various transportation systems, bridges, dams and water supply system
- Apply the concept of Harnessing energy from various energy sources
- Know the working of IC engines and identify the sub system requirements
- Apply manufacturing processes; casting, forming. List machining operations; lathe, drilling. Identify process of welding

Course Outcome (s) (COs):

CO1	Identify the building materials and its applications
CO2	Identify different transportation system, water supply system and its applications
CO3	List the basic components and analyze the working of major power plants
CO4	Identify the working of IC engines and understand the need of various auxiliary systems
CO5	Identify manufacturing processes; casting, forming. List machining operations; lathe, drilling. Identify process of welding

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	-	-	3	3	-	-	-	-	3	3	-
CO2	3	-	3	-	3	3	3	-	3	-	-	3	3	-
CO3	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO (Avg)	3		3		3	3	3		3			3	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (high)

M.KUMARASAMY COLLEGE OF ENGG.(AUTO)
Approved by
Board of Mechanical Engg.Dept
16 FEB 2018
KARUR - 639 113

UNIT I	BUILDING MATERIALS	9

Introduction to Civil Engineering, Building Materials, History, Disciplines in Civil Engineering, Early constructions and development over time, Ancient Monuments: Peruvudaiyar or Brihadeeswarar Temple, Kallanai dam Grand Anicut, Taj Mahal, Golconda fort, Angkor Wat, Pyramids of Giza, Colosseum Development of various materials, Methods of Construction, Building Materials - Stone – Classification of Rocks, Quarrying, Dressing, Properties and Uses of Stone Mortar, Plain and Reinforced Cement, Concrete Grade and properties and uses, Necessity of Special Concrete, Self Compacting Concrete, Construction Chemicals (Plasticizers), Recycling: construction, demolition wastes, Buildings, Classification of Buildings, Selection of site for a building, Components of Buildings, Soil, General types of soil, Bearing Capacity, Factors affecting bearing capacity, Foundations: Functions, General types of, foundation, Shallow foundations

UNIT II	TRANSPORTATION AND WATER SYSTEM	9

Cement concrete flooring, Marble flooring, Granite flooring, Ceramic tile flooring, Roofs: Types of roofs, Madras terrace roof, Reinforced concrete roofs, Trussed roof, Roof Coverings: Types, Weathering course: Types, Mode of Transportation - Highways - Classification of Roads, Cross section details of flexible pavements, Railways – Zone and Headquarters, Permanent way and its requirement, Components of Permanent way, Bridges: Components of Bridge, Types, Dams: Purpose, Classification, Gravity dams - Advantages and Disadvantages, Elements of protected Water Supply system, Objective, Quantity of water, Design period, Per-capita demand, Factor affecting per capita demand, Sources of Water Supply, Standards of Drinking water, Drinking Water Treatment: Objectives, Treatment plant process, Sewage: Method of collection, Sewage treatment and disposal

UNIT III	POWER PLANTS	9

Coal based thermal Power Plant: layout, components description,working, advantages, disadvantages, Hydro Electric power plant: layout, components description, working, advantages and disadvantages, Nuclear power plant: Nuclear fission and fusion reactions, Nuclear reactor, components description, Layout, working, merits and demerits of boiling water reactor , Layout, working, merits and demerits of pressurized water reactor, Gas turbine power plants:componentsdescription,working and types gas turbines, methods to improve performance, Layout and working of open cycle plant with intercooling, reheating, regeneration, Solar Thermal power plant: layout of Flat plate collector based plant, central receiver type plant, advantages, disadvantages, Wind energy conversion system – wind turbine types, Working, advantages and disadvantages, Ocean Thermal Energy Conversion system: layout of open cycle , Layout of closed cycle, advantages, disadvantages

UNIT IV	INTERNAL COMBUSTION ENGINES	9

Engine: Classification,operations of 2 stroke & 4 stroke, Comparison of SI & CI engines, Fuel supply system and Battery ignition system. Magneto ignition system of SI engine, Working of a simple carburetor, GDI, MPFI, CRDI, Lubrication system of an engine, Functions and Working of mist and forced feed lubrication system, Cooling system of an engine – Working of air cooled (fins), Water cooled engines (forced circulation), Alternate fuels for IC Engines. Liquid fuels: methanol, ethanol, vegetable oil, Biodiesel, Gaseous fuel: Hydrogen, CNG, LPG, properties, advantages, disadvantages, Emissions from engine – Emission standards – Euro, BS, Emission control measures – Catalytic converter, Exhaust gas recirculation, Introduction to electric vehicles, Hybrid and autonomous vehicles

UNIT V	CASTING AND FORMING PROCESS	9

Casting introduction and history, Expandable mold casting process , Production steps in a typical sand-casting process, terms including patterns and core, Other expendable mold casting: shell molding, vacuum molding, expanded polystyrene process, Investment casting, Permanent mold casting: hot chamber and cold chamber

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Approved By
Board of Mechanical Engg.On
06 FEB 2018
KARUR - 639 113

die casting & Permanent mold casting:Semi centrifugal and centrifuge casting, Metal forming introduction and its classification, metals and alloys,Bulk deformation: hot, cold forging processes, hot rolling processes,cold rolling processes, Rolling mill classification, hot and cold extrusion processes, wire and bar drawing processes, Sheet metal working, applications. Cutting operations: shearing, blanking, punching, cutoff, parting, slotting, perforating, notching, trimming, shaving, fine blanking, Bending operations: V-bending, edge bending, flanging, hemming,seaming, curling, spring back effect, Drawing operations, its defects, coining, embossing, ironing, lancing, twisting	
Text Book (s)	
1	Dr.V.Rameshbabu,"Basic Civil and Mechanical Engineering", VRB Publishers pvt ltd, 2017
Reference (s)	
1	SeropeKalpakjian, Steven Schmid," Manufacturing Processes for Engineering Materials", Pearson, 2016
2	Drbal, Larry F. Boston, Patricia G. Westra, Kayla L. Black, Veatch, "Power Plant Engineering", Kluwer Academic Pub., 1995
3	Andy Walker, "Solar Energy", John Wiley & Sons, 2013
4	John B. Heywood, "Internal Combustion Engine Fundamentals", Tata McGraw Hill Education, 2017
5	Kumar. T, LeenusJesu Martin and Murali. G, "Basic Mechanical Engineering", Suma Publications, Chennai, 2007.

LIST OF EXPERIMENTS

Total: 30hours

1.	Study of wood types, carpentry tools, operations and safety precautions.
2.	To make various carpentry joints like T-joint, lap joint, bridle joint, mortise tenon joint and etc.
3.	Study of pipeline joints, its location and functions in household fittings.
4.	Preparation of single tap, multi tap and shower connection by using GI and PVC pipes.
5.	Study about basics of fitting process, tools and method of producing models.
6.	Preparation of square, half round, step, V, T fitting of two metals by using fitting tools.
7.	Study of cutting, bending operations and tools used in sheet metal processes.
8.	To make trays, cone and funnel by using sheet metal operations.
9.	Study of welding types, tools, equipments and welded joints.
10.	Preparation of butt joints, lap joints and T-joints by shielded metal arc welding.
11.	Study about the types, properties and uses of brick, stone and cement.
12.	Study about water supply, distribution System, water treatment plant, sewage system
13.	Study about the basics of casting processes and equipments.

M. KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Approved by Board of Mechanical Engg.On
06 FEB 2018
KARUR - 639 113

Regulation 2018		Semester I /Semester II	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
S	18MES101J	ENGINEERING GRAPHICS (CIVIL)	1	0	4	3

Course Objective (s):

1. Construct ellipse, Parabola, hyperbola, cycloid and involutes.
2. Sketch the projection of points, straight lines and plane surfaces.
3. Sketch the Projection of simple solids like prisms, pyramids, cylinder and cone
4. Sketch the sectional solids and developing the lateral surfaces of simple solids
5. Understand the three dimensional drawing of simple solid by isometric projection and perspective projection, and convert isometric projection to orthographic projection.

Course Outcome (s) (COs):

CO1	Apply engineering graphic fundamentals to draw/evaluate engineering curves.
CO2	Draw the graphics of engineering parts with point, line and plane projections
CO3	Draw projection of solid objects like prisms, cylinders, pyramids and cones used in engineering objects
CO4	Develop the lateral surfaces of the sectional solids.
CO5	Create 3D part models using isometric and perspective projection.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	2	3	2	2	-	3	3	3
CO2	3	2	3	2	2	-	1	2	3	2	-	3	3	3
CO3	3	2	3	2	3	-	1	2	3	2	-	2	3	3
CO4	3	2	3	2	3	-	1	2	3	2	-	2	3	2
CO5	3	2	2	2	2	-	1	2	2	2	-	3	3	2
CO (Avg)	3	2	2.6	2	2.4	-	1.2	2.2	2.6	2	-	2.6	3	2.6

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Approved By
Board of Mechanical Engg.On
06 FEB 2018
KARUR - 639 113

UNIT I	PLANE CURVES	9
Principles of Engineering Graphics - Lettering - dimensioning - Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes – Drawing of tangents and normal to the above curves.		
UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	9
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations. Projection of polygonal surface and circular lamina inclined to both reference planes.		
UNIT III	PROJECTION OF SOLIDS	9
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.		
UNIT IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	9
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.		
UNIT V	ISOMETRIC PERSPECTIVE AND ORTHOGRAPHICS PROJECTIONS	9
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method. Isometric to orthographic multi-view.		

Text Book (s)

1	K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2010).
2	K. Venugopal& V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 15th edition (2018).

Reference (s)

1	1. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications, 2010.
2	2. R. L Jhala "Engineering Graphics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2015.
3	3. DhananjayA.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2008.
4	4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
5	5. M.S. Kumar, "Engineering Graphics", D.D. Publications, 2009.

M.KUMARASAMY COLLEGE OF ENGG.(AUTO)
Approved by
Board of Mechanical Engg.Cm
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KARUR - 639 113

List of Expertiments.

1	Spiral and involutes using bspline or cubic spline
2	Plan of residential building
3	Simple steel truss
4	Isometric projection of simple objects
5	Creation of 3D model
6	Orthographic projection of given 3D object
7	Projection of planes with inclination to reference plane
8	Solids with inclination to one reference plane
9	Section view of simple solids
10	Development of solids

M.KUMARASAMY COLLEGE OF ENGG.(AUTONO)
Approved By
Board of Mechanical Engg.On
06 FEB 2018
KARUR - 639 113

Regulation 2018		Semester III	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
ESC	18CES201T	ENGINEERING MECHANICS	3	1	0	4

Prerequisite Course (s)

Physics

Course Objective (s): The purpose of learning this course is to:

1.	To introduce coplanar and space forces and the conditions for the equilibrium of particles
2.	To enhance the practical knowledge on Newton's second law of motion to the dynamics of particles
3.	To determine the stresses, strains and its relation in simple and compound systems and to analyze trusses for member forces
4.	To find the shear stress of various section and geometric properties
5.	To understand the concepts of Torsion and spring

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Recognize the various force systems and laws of mechanics
CO2	Apply the basic concepts of dynamics in Rectilinear motion
CO3	Compute simple stresses and strains and analyse of plane truss
CO4	Compute geometric properties of sections and Compute bending and shear stresses for various sections
CO5	Illustrate the torsional effect in shafts and springs

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	2	-	-	-	-	-	2	2	1
CO2	3	2	2	1	-	1	-	-	-	-	-	1	2	2
CO3	3	2	2	2	-	2	-	-	-	-	-	2	2	2
CO4	3	2	2	1	-	2	-	-	-	-	-	2	2	1
CO5	3	2	2	2	-	2	-	-	-	-	-	2	2	2
CO (Avg)	3.00	2.00	2.00	1.40	0.00	1.80	0.00	0.00	0.00	0.00	0.00	1.80	200	1.60

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 25 MAR 2019 KARUR - 639 113

UNIT I	INTRODUCTION TO STATICS	9 + 3

Introduction - Units and dimensions - Laws of mechanics - Parallelogram law of forces - Vectors - Vectorial representation of forces -Coplanar forces - Resolution and composition of forces - Equilibrium of a particle under coplanar forces .

UNIT II	BASICS OF DYNAMICS	9+3

Kinematics and kinetics – displacements, velocity and acceleration - Equations of motion – Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity.

UNIT III	STRESSES AND STRAIN ,PLANE TRUSS	9 + 3

Introduction, stress, strain, tensile, compressive and shear stress – Hooke's law – Relationship among Elastic constants – Stress Strain Diagram for Mild Steel, TOR Steel, Concrete – Principle of superposition - Bars of Varying sections – Compound Bars.
PLANE TRUSSES: Analysis of Plane Trusses – Method of Joints.

UNIT IV	GEOMETRIC PROPERTIES OF SECTIONS	9 + 3

Centroid and moment of inertia of plane areas and compound sections, parallel axes and perpendicular axis theorems.

BENDING AND SHEAR STRESSES: Bending stresses ,shear stresses in various sections.

UNIT V	TORSION AND SPRING	9 + 3

Torsion of Circular and Hollow Shaft - Elastic Theory of Torsion-Stress and Deflection in Shafts - Stepped Composite Shafts - Combined Bending Moment and Torsion on Shaft - Strain Energy due to Torsion - Helical Spring - Leaf Spring.

Text Book (s)

1	Rajput. R.K., "Strength of Materials", S. Chand Publications, 2018
2	S.S. Bhavikatti and K.G.Rajasekarappa, "Engineering Mechanics", New Age International Pvt Ltd. 2015

Reference (s)

1	Timoshenko. S.P. and Young D.H., "Elements of Strength of Materials", 5th edition (SI Units), Affiliated East-West Press Ltd., New Delhi, 2012.
2	Bansal R K "Strength of Materials", Laxmi Publications, New Delhi, 2010
3	Ferdinand P. Beer and E. Russell Johnston Jr, "Mechanics of Materials", McGraw Hill Book Company, Singapore, 2014.
4	Jhunarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol. I, Charotar Publishing House, NewDelhi,2015.
5	Robert L.Mott, "Applied Strength of Materials", PHI Learning Pvt Ltd.," New Delhi, 2009

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
Approved On
25 MAR 2019
KARUR - 639 113

Regulation 2018		Semester III	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC201J	FLUID MECHANICS AND HYDRAULIC MACHINERY	3	0	2	4

Prerequisite Course (s)

Physics

Course Objective (s): The purpose of learning this course is to:

1.	Learn the basic properties of fluids.
2.	Get knowledge about dimensional analysis and model laws.
3.	Know the types and characteristics of open channel flow.
4.	Describe the uniform, gradually and rapidly varied flows in steady state conditions and flow in pipes.
5.	Know the various types of turbines and pumps.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Understand the properties of fluids and fundamental concept of fluid mechanics.
CO2	Understand the principle of model analysis and dimensional analysis by using various methods.
CO3	Apply their knowledge of fluid mechanics in addressing problems in open channels.
CO4	Solve problems in uniform, gradually and rapidly varied flows in steady state conditions and flow in pipes.
CO5	Apply principles of fluid mechanics to the operation, design, and selection of fluid machinery such as pumps and turbines.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	3	2	1	-	1	-	-	2	2	2
CO2	2	2	1	-	-	-	-	1	1	-	-	1	1	1
CO3	3	3	1	-	1	1	1	-	1	-	-	2	2	2
CO4	3	2	-	-	2	2	1	1	1	-	-	2	2	2
CO5	3	2	1	-	3	2	1	-	-	-	-	2	2	2
CO (Avg)	2.80	2.20	1.00	0.00	2.25	1.75	1.00	1.00	1.00	0.00	0.00	1.80	1.80	1.80

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
25 MAR 2019
KARUR - 639 113

UNIT I	FLUID PROPERTIES AND FLUID STATICS	9
Fluid and fluid properties- Definition-Capillary rise and fall-Surface tension-Vapour pressure, Compressibility, Bulk modulus-Viscosity-Newton's law of viscosity- Pressure measuring instrument-Manometer and Gauges.		
UNIT II	**DIMENSIONAL ANALYSIS AND MODEL STUDIES**	**9**
Fundamental and derived units-Dimensional homogeneity and Similarity-Rayleigh's method-Buckingham π theorem method-Model and its type-Model Laws and scale effects.		
UNIT III	**OPEN CHANNEL FLOW**	**9**
Open Channel Flow- Definition- Types-Properties of open channel - Velocity Distribution in Open Channel flow- Uniform Flow – Manning's and Chezy's formulas –Determination of depth and velocity - Most Economical Sections (Trapezoidal channel) - Drawdown and backwater curves - Hydraulic jump .		
UNIT IV	**FLOW THROUGH PIPES**	**9**
Major and Minor losses- Flow through pipes in series and parallel-Equivalent pipe and pipe network - Measuring instruments - Venturimeter, Orificemeter- Derivation - Euler's & Bernoulli's equation - Applications of Bernoulli's equation.		
UNIT V	**HYDRAULIC TURBINES AND PUMPS**	**9**
Turbines-Classification – working principles and velocity triangle of Pelton wheel, Francis and Kaplan Turbines Pumps- working principle of -Rotodynamic Pump, Positive displacement Pump.		
	LIST OF EXPERIMENTS	**30**

1. Flow Through Venturimeter
2. Flow Through Orificemeter
3. Determination of Major And Minor Losses In Pipes
4. Characteristic of Centrifugal Pumps
5. Characteristics of Reciprocating Pumps
6. Characteristics of Submersible pump
7. Flow Through Notches
8. Characteristics of Pelton Wheel Turbine
9. Characteristics of Kaplan Turbine
10. Characteristics of Francis Turbine

Text Book (s)	
1	R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Lakshmi publications, 2018, Delhi.
2	Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Rajsons Publications Pvt. Ltd., Delhi.

M. KUMARASAMY COLLEGE OF ENGG. (AUTONOMOUS) Board of Civil Engg. Approved On 25 MAR 2019 KARUR - 639 113

Reference (s)	
1	Roberson J.A and Crowe C.T., "Engineering Fluid Mechanics", Mumbai, Jaico Books, 2000.
2	Streeter, V.L.Wylie,E.B. and Bedford K.W, "Fluid Mechanics", 9th edition, New Delhi, TataMcGrawHill, 2017.
3	Jain A. K. "Fluid Mechanics". Khanna Publishers, 1998.
4	Fox W.R. and McDonald A.T., "Introduction to Fluid Mechanics", Singapore, John-Wiley and Sons, 2018.

M.KUMARASAMY COLLEGE OF ENGINEERING (AUTONOMOUS)
Board
25
KARUR - 639 113

Regulation 2018		Semester III	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC202T	CONSTRUCTION MATERIALS AND TECHNIQUES	3	0	0	3

Prerequisite Course (s)	
Basic Civil and Mechanical Engineering	
Course Objective (s): The purpose of learning this course is to:	
1	Summarize the knowledge of geology and its engineering considerations
2	Able to describe in details about rocks and its types
3	Acquire knowledge on commonly used construction materials
4	Obtain knowledge about various construction practices
5	Have exposure on sub-structure, super structure construction techniques
Course Outcome (s) (COs): At the end of this course, learners will be able to:	
CO1	Acquire the knowledge of the topographical formation, interior earth, gradational activities and weathering and also the theory of plate tectonics
CO2	Interpret minerals and rocks and assessment of its physical, mechanical and engineering properties.
CO3	Identify the appropriate materials used in construction
CO4	Sequence the various construction practices
CO5	Explore the sub structure and super structure construction techniques

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	2	3	2	-	-	-	1	1	2
CO2	3	1	1	-	-	2	3	2	-	-	-	1	1	2
CO3	2	1	2	1	-	2	-	3	-	2	-	2	3	3
CO4	3	1	2	1	-	2	-	3	-	2	-	2	3	3
CO5	2	1	2	2	-	2	-	3	-	2	-	2	3	3
CO (Avg)	2.60	1.00	1.60	1.33	0.00	2.00	3.00	2.60	0.00	2.00	0.00	1.60	2.20	2.60

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
25 MAR 2019
KARUR - 639 113

UNIT I	ENGINEERING GEOLOGY	9

Geology in Civil engineering – branches of geology – scope – earth structures and composition – elementary knowledge on continental drift and plate technologies – earth processes – weathering – types – geological work of river and wind – engineering considerations.

UNIT II	ROCKS AND BUILDING STONES	9

Classification of rocks – distinction between igneous, sedimentary and metamorphic rocks. Igneous rocks – Granite, Gabbro, Dolerite and Basalt. Sedimentary rocks – Sandstone, Limestone, Conglomerate and Breccia. Metamorphic rocks – Quartzite, Marble, Slate and Schist.

UNIT III	MATERIALS FOR CONSTRUCTION	9

Timber – market form of timber – veneer – plywood – bricks – steel – TMT and GFRP bars – steel fibre – glass fibre – plastic – types of plastic – PVC – UPVC – paint – distemper – varnish

UNIT IV	CONSTRUCTION PRACTICES	9

Stone masonry – brick masonry – load bearing wall – reinforced wall – framed structures – scaffolding and its types – basic of formwork – slip form work – centring – plastering – pointing.

UNIT V	CONSTRUCTION TECHNIQUES	9

Sub structures: Trenchless techniques – box jacking – pipe jacking – tunnelling – sheet piling – piling techniques.

Superstructures: Launching girders – Bridge decks – Shells – domes – Introduction to prefabricated structures.

Text Book (s)

1	Parbin Singh, "Engineering and General Geology", Taylor & Francis, 2009.
2	Arora S.P. and Bindra S.P., "The Text Book of Building Construction", Dhanpat Rai and Sons, 2010.

Reference (s)

1	F.G. Bell "Engineering Geology", Elsevier, 2nd ed. 2007.
2	Edward Allen and Joseph Iano, "Fundamentals of Building Construction: Materials and Methods", Wiley, 5th Edition, 2008.
3	Rangwala S.C., "Engineering Materials" Charotar Publishing House, Anand, India, 2014.
4	Peurifoy. R. L, "Construction Planning, Equipment and Methods", McGraw Hill Co., New York, 2010.

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 25 MAR 2019 KARUR - 639 113

Regulation 2018		Semester III	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC203J	SURVEYING	3	0	2	4

Prerequisite Course (s)

Physics

Course Objective (s): The purpose of learning this course is to:

1	To study the different surveying equipments in the field of civil engineering
2	To enhance the ability to calculate surveying quantities.
3	To enable the suitability of surveying instruments and method to a given problem
4	To learn about the advanced methods of surveying to solve complex civil engineering problems.
5	To understand the principle of modern surveying instruments.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Understand the basic classifications of surveying and to Compute the linear measurement in chain surveying.
CO2	Compute angular measurements in compass surveying and to prepare plan with plane table surveying.
CO3	Determine the Reduced levels of various points on ground and to compute the areas and volumes using levelling principles.
CO4	Determine the distance and heights of the object by using theodolite and to setting out curves by various methods.
CO5	To learn on the principles of Electronic distance measurements, Total station and GPS

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	1	-	-	-	-	-	2	2	2
CO2	3	3	2	-	3	2	-	-	-	2	-	2	3	2
CO3	3	3	2	-	3	2	-	-	-	2	-	2	3	2
CO4	3	3	2	-	3	-	-	-	-	2	-	2	2	2
CO5	3	2	-	-	3	1	-	-	-	-	-	3	3	3
CO (Avg)	3.00	2.80	2.00	0.00	3.00	1.50	0.00	0.00	0.00	2.00	0.00	2.2	2.6	2.2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Approved
25 MAR 2019
KARUR - 639 113

UNIT I	INTRODUCTION TO SURVEYING	9

Introduction: Definition, classification of surveys, Principles of surveying, Plan and map, Scale.

Chain surveying: Ranging and Chaining, survey station and survey lines, instruments used for setting out right angles, obstacles in chaining, Errors in chain survey.

UNIT II	COMPASS SURVEYING AND PLANE TABLE SURVEYING	9

Compass Surveying: Introduction, Bearing and angles, system of bearings, conversion of WCB to RB and vice versa, Prismatic compass, Magnetic declination, local attraction, Computation of compass traverse.

Plane Table Surveying: Accessories, working operations, methods of plane tabling-Radiation, Intersection, Traversing, Resection(Two point problem), Errors in plane table surveying.

UNIT III	LEVELLING	9

Levelling: Definitions, Levelling Instruments-Types of level and Level staff, temporary adjustments of a level, Benchmark and its types, methods of levelling - fly levelling - contouring.

Areas and Volumes: Calculation of areas and volumes by mid - ordinate, average ordinate, trapezoidal and Simpson's methods.

UNIT IV	THEODOLITE SURVEYING	9

Theodolite Survey: Types of theodolite, Parts of thedolite, Definitions, Measurement of horizontal and vertical angle, Tacheometric surveying - Stadia and tangential methods - setting out of simple curves.

UNIT V	MODERN METHODS OF SURVEYING	9

Electronic Distance Measurement (EDM) – Types - Principles - Total station, Global Positioning System (GPS) - segments of GPS, application of Total station and GPS.

LIST OF EXPERIMENTS	30

1. Aligning, Chaining and Ranging of a line
2. Determination of area of the boundary by traversing using chain (perpendicular offset)
3. Determination of included angles of a given boundary by traversing using compass
4. Locate the position of Plane table by radiation method.
5. Determine the reduced levels of the given points by Height of collimation
6. Determination of profile of the given area by Longitudinal and Cross sectioning in Levelling.
7. Measurement of horizontal angle by repetition method.
8. Measurement of vertical angles by using theodolite.
9. Determination of horizontal distance by Tangential method.
10. Mapping of College Campus using GPS.
11. Determination of Area by using Total station.
12. Foundation Marking

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg
Approved On
25 MAR 2019
KARUR - 639 113

Text Book (s)	
1	Punmia,B.C, Ashok K Jain and Arun K Jain, " Surveying" Vol. I&II, Laxmi Publication, 16th Edition, New Delhi, 2005.
2	Kanetkar,T.P, and Kulkarni,S.V, "Surveying and Levelling" Vol.I&II, United Book Corporation, 23rd Edition, Pune,1997.
Reference (s)	
1	Duggal S.K, "Surveying, Vol. I & II", Tata McGraw-Hill, Publishing Company, 2004.
2	Arora,K.R, "Surveying Vol.I & II", Standard Book House Publishers & Distributors, New Delhi, 2008
3	Venkatramaiah C, "Textbook of Surveying", University Press, 2nd Edition, Hyderabad, 2011.
4	Chandra .A.M "Plane Surveying and Higher Surveying", Chennai, New Age International (P) Limited, Publishers, 2002.

Regulation 2018		Semester III	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC204J	ENVIRONMENTAL ENGINEERING I	3	0	2	4

Prerequisite Course (s)

Environmental Science

Course Objective (s): The purpose of learning this course is to:

1	To impart knowledge on the various issues pertaining to quantity of water.
2	To impart knowledge on hydrological cycle and various sources of water
3	To emphasize the quality of water and various system of conveyance of water
4	To learn about Principles and design of water treatment system
5	To emphasize the need for distribution systems and service reservoir

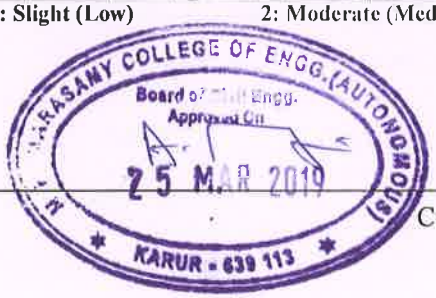
Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Analyze quantity of water and needs of public water supply schemes.
CO2	Identify the sources of water and evaluate the storage capacity of the reservoir.
CO3	Relate water quality criteria and standards to public health.
CO4	Construct appropriate treatment schemes to remove certain pollutants present in water
CO5	Design and evaluate water distribution alternatives on basis of chosen criteria.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	2	2	1	1	-	2	2	1
CO2	3	2	3	2	2	2	2	1	1	1	-	1	2	1
CO3	2	2	3	2	2	2	2	1	1	1	-	2	2	1
CO4	3	2	3	2	2	2	2	2	1	1	-	2	3	1
CO5	2	2	2	2	-	2	2	1	1	1	-	1	1	1
CO (Avg)	2.60	2.20	2.60	2.00	2.00	2.00	2.00	1.40	1.00	1.00	0.00	1.60	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)



UNIT I	INTRODUCTION	9

Necessary and objectives of public water supply schemes – planning and financing – report preparation of schemes-quantity of water – water requirements for continuous and intermittent supply – rate of demand – variations in rate of demand – its effect on design –design periods and capacities of different components –population growth and forecast estimating the quantity of water required.

UNIT II	HYDROLOGICAL CONCEPTS AND SOURCES OF WATER	9

Hydrological concepts-hydrological cycle – precipitation – types of precipitation – rain fall measurements – rain fall indices –estimation of surface runoff – Sources of water –types of sources – wells – lakes – ponds – rivers – infiltration galleries - intakes – types – intake tower – storage reservoirs – determination of reservoir storage capacity by analytical and mass curve methods.

UNIT III	QUALITY OF WATER AND CONVEYANCE OF WATER	9

Characteristics of water - sampling –analysis of water – water borne diseases – water quality standards- conveyance of water – types of conduits – hydraulics of pipe flow – pipe corrosion – theories – effect and prevention – laying and testing of pipe lines - pumps – pumping stations.

UNIT IV	TREATMENT OF WATER	9

Treatment of water – working principles, purpose and design – screening – plain sedimentation – coagulation– filtration – disinfection – water softening – ion exchange- membrane processes.

UNIT V	DISTRIBUTION OF WATER AND IMPACT OF WATER SUPPLY SCHEMES	9

Distribution of water – requirements of good distribution system – method of distribution system – layouts of distribution system – distribution reservoirs – purpose – types– preventive methods to reduce wastage of water – impact of water supply schemes- 3R principles of water management.

LIST OF EXPERIMENTS	30

1. Sampling and preservation methods and significance of characterization of water and Wastewater.
2. Determination of pH and turbidity
3. Determination of hardness of water
4. Determination of dissolved oxygen
5. BOD Test
6. COD Test
7. Determination of ammonia nitrogen in water sample
8. Determination of nitrates in water sample
9. Determination of phosphate in water sample
10. Determination of potassium and sodium
11. Heavy metals determination – chromium, lead and zinc. (Demonstration only)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
Approved
25 MAR 2019
KARUR - 639 113

Text Book (s)	
1	Garg, S.K., "Environmental Engineering Vol. I", 24th Edition, New Delhi, Khanna Publishers, 2018.
2	Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prenticehall new arrivals 2012.
Reference (s)	
1	"Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2	Qasim, S.R., Motley, E.M. and Zhu.G. "Water works Engineering – Planning, Design and Operation", Prentice Hall, New Delhi, 2002.
3	Birdie, G.S. and Birdie, J.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and Sons, New Delhi, 2014.
4	Punmia, B.C., Jain, A.K., and Jain.A., "Environmental Engineering, Vol.I," Lakshmi Publications,2015.
5	Poonia, M.P.,Sharma, S.C., "Environmental Engineering",Khanna Publishers, 2018.

Regulation 2018		Semester III	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PROJ	18CEP103L	MINOR PROJECT I	0	0	2	1

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report

Course Outcome (s) (COs): At the end of this course, learners will be able to:

Identify the requirement and develop the concepts or models through standard procedure and preparation of report

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	0	1	1	1	1	1	1	-	1	2	1
CO (Avg)	3.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Strategy(s)

- The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department

Regulation 2018		Semester III	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18MBM201L	COMPETENCIES IN SOCIAL SKILLS	0	0	2	1

Course Objective (s):

The purpose of learning this course is to:

1	Sharpen problem solving skill and to improve thinking capability of the students
2	Hone soft skill and analytical ability of students
3	Engage learners in using language purposefully and cooperatively
4	Expertise the writing and presentation skill to fulfill the corporate expectations

Course Outcome (s) (Cos):

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

CO1	Solve both analytical and logical problems in an effective manner
CO2	Design and deliver information in a proper manner
CO3	Improve their presentation skills individually as well as a team member

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	-	-	-	-	-	-	-	-	-	2	-	-			
CO3	-	-	-	-	-	-	-	-	2	-	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	-	-	-	-	-	-	-	-			
CO (Avg)	3.00	-	-	-	-	-	-	-	2.00	2.00	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	Module - 1	6
Aptitude: Coding & Decoding - Direction Sense Test. **Communication:** Self-Introduction and SWOT analysis - Letter writing - types.		
UNIT II	**Module - 2**	**6**
Aptitude: Venn Diagrams - Data Interpretation. **Communication:** Phrasal verbs - Voice of Valluvar.		
UNIT III	**Module - 3**	**6**
Aptitude: Averages. **Communication:** Idioms and Phrases - Skits.		
UNIT IV	**Module - 4**	**6**
Aptitude: Time and Distance - Problems on Trains. **Communication:** Prefix/Suffix - Root words - Adjectives - JAM (Extempore Speech).		
UNIT V	**Module - 5**	**6**
Aptitude: Clocks & Calendars. **Communication:** Homophones - Frame Tales.		

Text Book (s)

1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015

Regulation 2018		Semester IV	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
ESC	18CES202L	COMPUTER AIDED CIVIL ENGINEERING DRAWING	0	0	4	2

Prerequisite Course (s)

Basic Civil and Mechanical Engineering, Engineering Graphics

Course Objective (s): The purpose of learning this course is to:

1. Understand the building bye-laws and NBC requirements.
2. Understand the need for approval and introduction to drafting in Auto Cad

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Apply building bye-laws and NBC requirements in planning a building.
CO2	Prepare a plan suitable for approval by any regulatory body using Auto Cad

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	3	2	3	2	2	-	3	3	3
CO2	3	2	1	-	3	3	2	3	2	2	-	3	3	3
CO (Avg)	3.00	2.00	1.00	-	3.00	3.00	2.00	3.00	2.00	2.00	-	3.00	3.00	3.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

LIST OF EXPERIMENTS	60

1. Introduction building bye-laws
2. Drawing of signs and symbols
3. Planning of residential buildings with RCC flat roof.
4. Planning of residential building with pitched roof.
5. Framed structure – Planning of primary school building
6. Industrial building with steel roof truss.
7. Approval plan of Single storey Residential building – plan, elevation and cross section.
8. Approval plan of Multi storied Residential building – plan, elevation and cross section.
9. Planning of Commercial building
10. Planning of IT Park

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 25 MAR 2019 KARUR - 639 113

Reference (s)	
1	National Building Code 2016
2	Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2004.
3	Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.
4	A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 2008.
5	Sikka V. B., "A Course in Civil Engineering Drawing", 4th Edition, S.K. Kataria and Sons, 1998.

COLLEGE OF ENGG.(AUTONOMOUS)
Approved On
25 MAR 2019
KARUR - 639 113

Regulation 2018		Semester IV	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC205J	STRENGTH OF MATERIALS	3	0	2	4

Prerequisite Course (s)

Engineering Mechanics

Course Objective (s): The purpose of learning this course is to:

1	To study the different methods of finding deflection of statically determinate beam and to draw the shear force, bending moment diagrams.
2	To analyse the Indeterminate beams and to draw the shear force, bending moment diagrams.
3	To analyze the column with different end conditions
4	To study about the unsymmetrical bending.
5	To understand the concepts of plane stresses, thick and thin cylinders and understand the behaviour of materials under various loading conditions.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	To impart knowledge on behaviour of structural elements subjected to transverse load
CO2	To recognize the behaviour of statically indeterminate beams.
CO3	To learn about the behavior of columns
CO4	To develop the concepts of unsymmetrical bending of beams and shear centre
CO5	To learn the concepts of stress in thick and thin cylinder and plane stresses
CO6	To able to obtain the material strength and stiffness properties of structural elements

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	2	2	1	1	1	-	-	2	3	3
CO2	2	2	2	-	-	2	1	2	1	-	-	2	2	3
CO3	2	2	2	-	-	-	1	3	1	-	-	2	3	3
CO4	3	3	2	-	-	3	-	2	-	-	-	1	1	2
CO5	3	3	2	-	-	3	-	3	1	-	-	2	1	2
CO6	1	1	1	1	2	2	1	1	1	-	-	2	2	2
CO (Avg)	2.33	2.33	1.83	1.00	2.00	2.40	1.00	2.00	1.00	0.00	0.00	1.83	2.00	2.50

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	STATICALLY DETERMINATE STRUCTURES	9

Introduction, types of beams –Types of loads – concentrated load, uniformly distribute load, uniformly varying load and couples. Shear force and bending moment diagram for statically determinate beams (cantilever, simply supported and over hanging with PL, UDL)- Deflection Curve –Double Integration Method – Macaulay's Method

UNIT II	STATICALLY INDETERMINATE STRUCTURES	9

Propped Cantilever Beams – Fixed Beams – Continuous Beams – Theorem of Three Moments – Calculation of reactions, Bending Moments and Shear Force – Shear Force and Bending Moment Diagrams (for Concentrated Load and UDL).

UNIT III	THEORY OF COLUMNS	9

Members Subjected to Axial Load – eccentric load – Slenderness Ratio – End Conditions – Buckling Load for Columns- Euler's Theory – Assumptions and Limitations – Rankine - Gordon Formula.

UNIT IV	UNSYMMETRICAL BENDING AND SHEAR CENTRE	9

Unsymmetrical Bending – Product of Inertia – Stresses due to Unsymmetrical Bending – Deflection of beams due to Unsymmetrical Bending – Shear Centre – Definition – Shear Centre for Symmetrical and Unsymmetrical Sections.

UNIT V	PRINCIPAL PLANE ANDCYLINDERS	9

PRINCIPAL PLANE: Analysis of plane stress and strain, principal stresses and strains

THICK & THIN CYLINDER: Stresses and deformation of Thin cylindrical and spherical shells – Wire Wound Cylinders - Thick cylinder - Lame's theorem - Stress distribution - Compound cylinders.

LIST OF EXPERIMENTS	30

1. Tension test on mild steel rod
2. Torsion test on mild steel bar
3. Tension and compression test on springs
4. Compression test on bricks and concrete cubes
5. Hardness test on different metals (Brinell and Rockwell)
6. Deflection test on simply supported beams (for different metals)
7. Charpy and Izod Impact Test
8. Double shear test (for different metals)
9. Compression and bending test on wood specimens

Text Book (s)

1	Rajput.R.K, "Strength of Materials", S. Chand & Co., New Delhi, 2014
2	Sadhu Singh, "Strength of Materials", Khanna publishers, New Delhi, 2013.

3	Vaidyanathan.R, Perumal.P and Lingeswari.S, "Mechanics of Solids and Structures", Volume I", Scitech Publications Pvt Ltd, Chennai, 2006.
Reference (s)	
1	Prasad.I.B, "Strength of Materials", Khanna Publishers, New Delhi, 1998
2	James .M. Gere "Mechanics of Materials", Thomson India, Brooks/Cole, 2006
3	Kazimi, "Solid Mechanics", Tata McGraw Hill, 1998.
4	Bansal R K "Strength of materials", Laxmi Publications, New Delhi, 2010

Regulation 2018		Semester IV	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC206T	CONCRETE TECHNOLOGY	3	0	0	3

Prerequisite Course (s)

Construction Materials and Techniques

Course Objective (s): The purpose of learning this course is to:

1	To Understand on properties of materials required for concrete
2	Know the Concepts of various Chemical and Mineral admixtures
3	Ability to perform concrete mix design
4	Types of concrete and their manufacture and tests are covered in this course.
5	Ability to get the experience of advancement in concrete research area

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Identify Quality Control tests on concrete making materials
CO2	Know the Concepts of various Chemical and Mineral admixtures
CO3	Design the concrete mix as per IS Method
CO4	Understand the behavior of fresh and hardened concrete
CO5	Understand the need for special concretes

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	1	1	-	1	-	3	2	2
CO2	3	2	-	-	-	3	1	-	-	-	-	2	2	2
CO3	3	2	3	2	-	3	2	1	1	-	-	3	3	2
CO4	3	2	-	-	-	2	1	-	-	-	-	3	2	2
CO5	3	2	-	-	-	2	1	-	-	-	-	1	1	2
CO (Avg)	3.00	2.00	3.00	2.00	0.00	2.40	1.20	1.00	1.00	1.00	0.00	2.40	2.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	CONSTITUENT MATERIALS	9
Cement –Manufacturing of Cement – Types and grades of Cements – Chemical composition and Properties – Hydration of cement – Tests on cement – Aggregates – Classification -Mechanical properties and tests as per BIS – Water – Quality of water for use in concrete –IS Specifications		
UNIT II	**ADMIXTURES**	**9**
Admixtures – Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline – Effects on concrete properties.		
UNIT III	**MIX DESIGN**	**9**
Principles of Mix Proportioning – Factors in the choice of mix proportions – Physical properties of materials required for Mix Design – Water/Cement ratio – Design Mix and Nominal Mix – Methods of Mix Design – BIS Method.		
UNIT IV	**PROPERTIES OF CONCRETE**	**9**
Manufacture of concrete – Workability – Testing of fresh Concrete – Segregation and Bleeding – Different Curing methods – Testing of Hardened concrete: Compressive Strength, Split tensile strength, flexural strength – Non-destructive testing methods: Rebound hammer method, Pull out test method, Ultrasonic pulse velocity method.		
UNIT V	**SPECIAL CONCRETES**	**9**
Light weight concretes – Self compacting concrete – Vacuum concrete – High strength concrete – High performance concrete – Fibre reinforced concrete –Ferrocement – Ready mix concrete – SIFCON – Geopolymer Concrete.		

Text Book (s)

1	M. S. Shetty, "Concrete Technology" S. Chand & Company Ltd., New Delhi 2017.
2	Gupta B.B., Amit Gupta, "Concrete Technology" Jain book Agency,2010.

Reference (s)

1	A. M. Neville "Properties of Concrete" Pitman 5th edition Education ltd 2016.
2	M.L. Gambhir "Concrete Technology" – Tata Mc. Graw Hill Publishers, New Delhi,2009
3	Santhakumar,A.R "Concrete Technology" , Oxford University Press, New Delhi,2007
4	IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2019

Regulation 2018		Semester IV	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC207J	SOIL MECHANICS	3	0	2	4

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

CO1	To impart knowledge on soil properties relevant to Civil Engineering and their determination
CO2	Understand the physical significance of effective stress and its relation with pore pressure
CO3	Understand how stresses are transferred through soils and be able to compute both geostatic and induced stresses due to point, line, and area loads.
CO4	To impart knowledge on estimation of the amount of consolidation and settlement
CO5	Computation of shear strength parameters and differentiate various modes of slope failure

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Identify the types of soil and expected behavior on application of load
CO2	Determine the permeability of soil, estimate soil stresses and prepare flow net diagram.
CO3	Estimate the stresses and displacement in soil mass due to various type of surface loading
CO4	Estimate the total settlement and time rate of settlement of the soil.
CO5	Analyze shear properties of cohesive and cohesion less soils and Analyze the slope failure

CO-PO Mapping

COs	Pos												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	3	1	1	-	1	1	-	1	3	1
CO2	3	2	2	-	2	1	1	-	1	1	-	1	3	1
CO3	2	2	2	-	-	1	1	-	1	1	-	1	3	1
CO4	3	2	2	-	2	1	1	-	1	1	-	1	3	1
CO5	2	2	2	-	2	1	1	-	1	1	-	1	3	1
CO (Avg)	2.60	2.00	2.00	0.00	2.25	1.00	1.00	0.00	1.00	1.00	0.00	1.00	3.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 25 MAR 2019 KARUR - 639 113

UNIT I	PHYSICAL PROPERTIES AND CLASSIFICATION OF SOIL	9

Soil formation – Soil problems in Engineering – Physical properties of soil – Phase relations – Index properties of soil –Grain size distribution – Atterberg's limits – Identification and classification of soils (BIS classification).

UNIT II	PERMEABILITY AND SEEPAGE IN SOILS	9

Soil water - concept of total, neutral and effective stresses - capillary phenomena - Permeability and its determination methods - permeability of stratified soils - Seepage flow - one dimensional flow - flow net - Determination of seepage quantity, quick sand condition

UNIT III	STRESS DISTRIBUTION	9

Vertical stress distribution in soil - Influence factors, Isobars, Boussinesq's equation, Westergaard's equation and Newmark's Influence Chart – Stress below equivalent point load. Contact pressure under rigid and flexible area.

UNIT IV	COMPACTION AND CONSOLIDATION	9

COMPACTION

Compaction – Laboratory test – Standard proctor's compaction – Modified proctor's compaction – Factors affecting compaction – Field compaction methods – Compaction control;

CONSOLIDATION

Consolidation – Immediate, primary and secondary consolidation,consolidation test - interpretation of consolidation test results, Terzaghi's theory of consolidation, pressure void ratio relationship, pre-consolidation pressure - Total settlement; co-efficient of consolidation – Curve fitting methods, rate of settlement

UNIT V	SHEAR STRENGTH AND SLOPE STABILITY	9

SHEAR STRENGTH

Shear strength - failure criterion- shear strength tests - direct shear test, UCC, Vane shear test and tri axial test - Different drainage conditions- Shear properties of cohesive and cohesion less soils - Mohr's Stress circle;

SLOPE STABILITY

Slope failure mechanisms - finite slopes and infinite slopes - Swedish circle method - Friction circle method (Theory only).

LIST OF EXPERIMENTS	30

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis & Hydrometer analysis
3. Liquid limit, Plastic limit, Shrinkage limit tests
4. Field density Test (Sand replacement method and Core cutter method)

M.KUMARASAMY COLLEGE OF ENGG. (AUTO) Board of Studies Approved 29 MAR 2019 KARUR - 639 113

5. Determination of moisture – density relationship using standard Proctor compaction test. 6. Permeability determination (constant head and falling head methods) 7. Direct shear test in cohesion-less soil- Demonstration only 8. Unconfined compression in cohesive soil - Demonstration only 9. One dimensional consolidation test(Determination of co-efficient of consolidation – Demonstration only)	
Text Book (s)	
1	Punmia P.C, "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd, New Delhi, 2017.
2	Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2014.
Reference (s)	
1	Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2011.
2	McCarthy, D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", 6th Edition, Prentice Hall of India, 2002.
3	Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri ,"Soil Mechanics in Engineering Practice", 3rd Edition, John Wiley & Sons, 1996
4	Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, 2000

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
25 MAR 2019
KARUR - 639 113

Regulation 2018		Semester IV	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC208T	ENVIRONMENTAL ENGINEERING II	3	0	0	3

Prerequisite Course (s)

Environmental Engineering I

Course Objective (s): The purpose of learning this course is to:

1	To impart knowledge on the various issues pertaining to quantity of waste water.
2	To impart knowledge on characteristics of wastewater.
3	To emphasize the principles and design of wastewater treatment system.
4	To learn about principles and design of sludge management system.
5	To emphasize the need for secure wastewater disposal systems and reuse of used water.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Analyze quantity of wastewater and needs of sewerage system.
CO2	Identify the characteristics of wastewater and design the primary treatment units of wastewater.
CO3	Construct appropriate treatment schemes to remove certain pollutants present in wastewater
CO4	Adapt the suitable mode of disposal for the residual without endangering the environment.
CO5	Design and evaluate wastewater disposal alternatives on basis of chosen criteria.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	2	2	1	1	1	2	2	1
CO2	3	3	3	2	-	2	2	1	1	1	1	1	2	1
CO3	3	3	3	2	-	2	2	1	1	1	1	2	2	1
CO4	3	2	3	1	-	2	3	2	1	1	1	2	3	1
CO5	3	2	2	1	-	3	3	1	1	1	1	1	1	1
CO (Avg)	3.00	2.60	2.60	1.6	0.00	2.20	2.40	1.40	1.00	1.00	1.00	1.60	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Studies
Approved on
25 MAR 2019
KARUR - 639 113

UNIT I	PLANNING AND DESIGN OF SEWERAGE SYSTEM	9
Definition – classification – systems of sewerage – quantity of sewage – fluctuation in flow pattern – estimation and storm runoff – design flow for separate and combined system – hydraulics of sewers - self cleansing velocities – full flow / partial flow conditions – sewer sections – material for sewers – sewer joints – jointing materials – sewer laying under various conditions – test on sewers – sewer maintenance – sewer appurtenances – sewage pumping – types of pumps.		
UNIT II	**CHARACTERISTICS ANDPRIMARY TREATMENT OF WASTEWATER**	**9**
Characteristics and composition of sewage – physical and chemical analysis – DO and BOD and their significances – cycles of decomposition – fundamentals of microbiology of wastewater – primary treatment – screens –principles of grit chambers – principles, types of sedimentation – design of sedimentation tanks – septic tanks and effluent disposal systems.		
UNIT III	**BIOLOGICAL TREATMENT OF WASTEWATER**	**9**
Basic principles of biological treatment – activated sludge process – recirculation – diffuser – mechanical aeration – process modification – oxidation ditch – trickling filter – principles – NRC equation–principles of rotating biological contactor (RBC)– principles of sequencing batch reactor(SBR) – principles of membrane bioreactor – principles of UASB.		
UNIT IV	**SLUDGE MANAGEMENT AND HOUSE DRAINAGE**	**9**
Objectives of sludge treatment – properties and characteristics of sludge – sludge thickening – sludge digestion – drying beds – conditioning and dewatering – sludge disposal – sanitary fixtures and fitting – pipe system – general layout of house drainage.		
UNIT V	**SEWAGE DISPOSAL**	**9**
Methods – dilution – self-purification of streams – oxygen sag curve – wastewater reclamation techniques – land disposal – sewage farming - deep well injection – eutrophication – recycle and reuse of wastewater.		

Text Book (s)	
1	Garg, S.K., "Environmental Engineering Vol. II", 24th Edition, New Delhi, Khanna Publishers, 2018
2	Punmia, B.C., Jain, A.K., and Jain.A., "Environmental Engineering, Vol.II", Lakshmi Publications, 2015.
Reference (s)	
1	Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
2	Poonia, M.P.,Sharma, S.C., "Environmental Engineering",Khanna Publishers, 2018.
3	Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prenticehall new arrivals 2012.
4	Birdie, G.S. and Birdie, J.S., "Water Supply and Sanitary Engineering", DhanpatRai and Sons, New Delhi, 2014.

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Studies Approved on 25 MAR 2019 KARUR - 639 113

Regulation 2018		Semester IV	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PROJ	18CEP104L	MINOR PROJECT II	0	0	2	1

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report

Course Outcome (s) (COs): At the end of this course, learners will be able to:

Identify the requirement and develop the concepts or models through standard procedure and preparation of report

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	2	1	1	1	1	-	1	2	1
CO (Avg)	3.00	2.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Strategy(s)

- The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department

Regulation 2018		Semester IV	Total Hours			30
			Hours / Week			C
Category	Course Code	Course Name	L	T	P	
M	18MBM202L	CRITICAL AND CREATIVE THINKING SKILLS	0	0	2	1

Course Objective (s):

The purpose of learning this course is to:

1	Focus on listening, speaking, & writing skills through audio & video sessions
2	Hone soft skill and analytical ability of students
3	Overcome the fear in group communication and to provide the effective communication
4	Expertise intelligible pronunciation, stress and intonation patterns

Course Outcome (s) (Cos):

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

CO1	Solve both analytical and logical problems in an effective manner
CO2	Demonstrate an ability to design and deliver messages
CO3	Improve their communication with practical experience

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	-	-	-	-	-	-	-	-	-	2	-	-			
CO3	-	-	-	-	-	-	-	-	-	2	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	-	-	-	-	-	-	-	-			
CO (Avg)	3.00	-	-	-	-	-	-	-	-	2.00	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	Module - 1	6
Aptitude: Time and Work - Pipes and Cisterns. **Communication:** Sentence Pattern - Debate.		
UNIT II	**Module - 2**	**6**
Aptitude: Boats and Streams. **Communication:** Tenses and voices - Tech Talk.		
UNIT III	**Module - 3**	**6**
Aptitude: Problems on Ages - Probability **Communication:** Analogies - Biography.		
UNIT IV	**Module - 4**	**6**
Aptitude: Data sufficiency - Logical Puzzles. **Communication:** Punctuation - Connection.		
UNIT V	**Module - 5**	**6**
Aptitude: Mensuration. **Communication:** Preposition - News of the Week.		

Text Book (s)	
1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015

M.KUMARASAMY COLLEGE OF ENGG. (AUTONOMOUS)
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25 MAR 2019
KARUR-639 113.

Regulation 2018		Semester V	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC301T	ANALYSIS OF STRUCTURES	3	1	0	4

Prerequisite Course (s)

Engineering Mechanics, Strength of Material

Course Objective (s): The purpose of learning this course is to:

1	Analyse the indeterminate structures for internal forces by moment Distribution method and slope deflection method.
2	Analyse and solve parabolic and circular arched structures.
3	Formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate problems.
4	Have knowledge on influence lines for statically determinate structures.
5	Introduce the importance of plastic analysis to calculate the collapse loads for beams and frames.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Analyse Indeterminate Structures using Moment Distribution Method and Slope Deflection Method.
CO2	Analyse the Arches under External Loads, Temperature Effects.
CO3	Analyse Structures using Stiffness Matrix Method.
CO4	Analyse Indeterminate Beams with Moving Loads.
CO5	Perform Plastic Analysis for Indeterminate Beams and Frames

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO2	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO3	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO4	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO5	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO (Avg)	3.00	2.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD	9+3

Degree of static and kinematic indeterminacy: Analysis of continuous beams – Sinking of Supports – Slope Deflection Method –Carry over factor – Distribution factor – Analysis of Continuous Beams – Analysis of single storey and single bay rectangular vertical frames without sway – Moment Distribution Method.

UNIT II	ARCHES	9+3

Arches as structural forms – Examples of arch structures –Types of arches – Analysis of three hinged and two hinged parabolic and circular arches–temperature effects.

UNIT III	MATRIX STIFFNESS METHOD	9+3

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacement vectors – Analysis of pin-jointed plane frames, continuous beams and rigid frames.

UNIT IV	MOVING LOADS AND INFLUENCE LINES	9+3

Introduction – Moving loads for statically determinate structures – construction of lines for reaction, SF and BM for rolling loads for simply supported and overhanging beams – computation of load positions for maximum bending moment and maximum shear force – absolute maximum bending moment– Muller Breslau's Principle – Construction of ILD for continuous beams.

UNIT V	PLASTIC ANALYSIS OF STRUCTURES	9+3

Plastic moment of resistance – Plastic Modulus – Shape factor – Load factor – Plastic Hinge and mechanism – Analysis of indeterminate beams and frames mechanism method.

Text Book (s)

1	Vaidyanadhan.R and Perumal.P, "Comprehensive Structural Analysis – Vol. I and Vol. II", Laxmi Publications, New Delhi, 2010
2	Bhavikatti S S, Structural Analysis Vol-1and 2, Vikas publishing House, PVT, LTD., 2013
3	Reddy C.S., –Basic Structural Analysis‖, Tata McGraw Hill Publishing Co., 2011.

Reference (s)

1	Ramamurtham.S– Theory of structures, Dhanpat Raiand Sons, New Delhi, 2014.
2	Dr.B.C.Punmia, Er.Ashok K Jain, Dr.Arun K Jain, Theory of Structures, Lakshmi publications, 2017

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC302T	DESIGN OF STEEL STRUCTURES	3	0	0	3

Prerequisite Course (s)

Engineering Mechanics, Strength of Materials

Course Objective (s): The purpose of learning this course is to:

1	Familiarise knowledge on Limit State Design Methods for steel Structures and design of connections
2	Have knowledge on the design of tension members.
3	Expertise on the design of compression members.
4	Acquire knowledge on the design of beams.
5	Impart knowledge on the design of roof trusses

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Design of Bolted and Welded Connections
CO2	Design Tension Members and Splices
CO3	Design Compression Members, Lacings, Battens and Column Base
CO4	Design Laterally Supported and Unsupported Beams and Built-Up Beams.
CO5	Acquire Knowledge about Components of Industrial Structures and Design of Purlins.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO2	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO3	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO4	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO5	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO (Avg)	3.00	2.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

UNIT I	INTRODUCTION	9
Introduction to steel structures – Properties - Standard steel sections - IS800:2007 related provisions - Type of Loads on Structures and Load combinations - Design of bolted and welded connections for axial load - Efficiency of joint.		
UNIT II	**TENSION MEMBERS**	**9**
Introduction to types of Tension Members - Calculation of net area - Net effective sections for angles and Tee in tension - Design of tension members - Design of tension splices.		
UNIT III	**COMPRESSION MEMBERS**	**9**
Introduction to types of compression members - Codal provisions for compression members - Design of Compression Members - Design of lacings and battens - Design of column base: Slab Base.		
UNIT IV	**DESIGN OF BEAMS**	**9**
Introduction to design of flexural members - Classification of cross sections - Flexural Strength and Lateral stability of Beams - Shear Strength-Web Buckling, Crippling and defection of Beams - Design of laterally supported and unsupported beams.		
UNIT V	**ROOF TRUSSES AND INDUSTRIAL BUILDINGS**	**9**
Introduction to industrial building - roofing, cladding and wall material - structural components and framing -types of roof trusses - components - wind load estimation as per IS875 part 3 - design of purlins using Channel and Angle sections.		

Text Book (s)	
1	Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2	Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2014
Reference (s)	
1	Ramachandra, "Design of Steel Structures", Vol. I and II, Standard publishers Distributors, New Delhi, 2010
2	Negi.L.S, Design of Steel Structures, McGraw Hill Education, 2017.
Code Book(S):	
1	IS: 800 – 2007, "General Construction in Steel" - Code of Practice.
2	IS 875- 2015," Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures - Part 3: Wind Loads".
3	SP 6(I) – 1964, "Handbook for Structural Engineers".

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Regulation 2018		Semester V	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC303T	HIGHWAY AND RAILWAY ENGINEERING	3	0	0	3

Prerequisite Course (s)

Construction Materials and Techniques

Course Objective (s): The purpose of learning this course is to:

1	Impart knowledge onplanning of highway and their alignment
2	Describe the geometric design of highways
3	Provide basic knowledge on the construction and maintenance of pavements
4	Outline the basics of railway engineering and railway components
5	Impart knowledge on construction and maintenance of railway tracks and introduction to other transportation systems

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Plan for a highway and its alignment
CO2	Understand the geometric design of highways
CO3	Know about the construction and maintenance of pavements
CO4	Comprehend the desirable properties of permanent way components
CO5	Understand the construction and maintenance of railway tracks

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	1	-	-	-	-	-	1	3	2
CO2	3	2	-	-	-	1	-	-	-	-	-	1	1	2
CO3	3	2	-	-	-	1	-	-	-	-	-	1	3	2
CO4	3	2	-	-	-	1	-	-	-	-	-	1	2	1
CO5	3	2	-	-	-	1	-	-	-	-	-	1	3	2
CO (Avg)	3.00	2.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	2.40	1.80

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

UNIT I	HIGHWAY PLANNING AND ALIGNMENT	9

Introduction – Modes of transportation - History of Road Construction – Significance of highway planning –Requirements of Ideal Alignment - Factors Controlling Highway Alignment - Engineering Surveys for Alignment - Conventional Methods and Modern Methods - Horizontal Curves - Super elevation - Design of Vertical Alignments- Gradients and its types

UNIT II	GEOMETRIC DESIGN OF HIGHWAYS	9

Highway Cross Sectional Elements - Sight Distances – Factors affecting Sight Distances - PIEV theory-Stopping Sight Distance (SSD) - Overtaking Sight Distance (OSD) [Problems in SSD and OSD] - Rigid and Flexible Pavements - Components and their Functions - Factors affecting the Design of Pavements

UNIT III	PAVEMENT CONSTRUCTION AND MAINTENANCE	9

Design Practice for Flexible Pavements [IRC Method and Recommendations only] - Design Practice for Rigid Pavements [IRC Recommendations- concepts only] - Construction Practice - Water Bound Macadam Road - Types of maintenance - Types of defects in Flexible pavements - Types of failures in Rigid Pavements - Optimum cost of maintenance - Evaluation of pavement Failure by Benkelman Beam Method [Procedure only].

UNIT IV	RAILWAY ENGINEERING	9

Introduction about traditional and metro system with advantages- Permanent way and its Components - Functions of each Component: Rails - Types of Rails, Rail fastenings- Concept of gauges- Coning of wheel - Gradient and grade compensation - super elevation - Cant deficiency -Negative super elevation.

UNIT V	RAILWAY TRACK CONSTRUCTION AND MAINTENANCE	9

Laying of Track - Points and Crossings - Fouling Mark- Design of Turnouts, Working Principle of Signaling–Maintenance: Conventional, Modern methods and Materials - Track Drainage - Layouts of Railway Stations and Yards, Rolling Stock.

Text Book (s)

1	KhannaS.K., C.E.G.Justo and Dr.A.Veeraraghavan, "Highway Engineering", Nemchand and Bros, 2018.
2	SaxenaSubhash C and Satyapal Arora, "A Text Book of Railway Engineering", DhanpatRai Publications Delhi, 2011

Reference (s)

1	Rangwala.S.C, "Railway Engineering" Charotar Publishing House Pvt.Ltd., Anand, India. 2017.
2	Subhash C Saxena, "Textbook of Highway and Traffic Engineering" CBS Publishers, 2017.
3	Sharma.S.K, "Principles, Practice and Design of Highway Engineering" S.Chand and Co, 2011.

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Regulation 2018		Semester V	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC305L	CONCRETE AND HIGHWAY ENGINEERING LABORATORY	0	0	4	2

Prerequisite Course (s)

Concrete Technology

Course Objective (s): The purpose of learning this course is to:

1	Study the properties of constituent materials, fresh concrete and mix design procedure.
2	Learn the tests on hardened concrete and how the different materials shall modify the performance of concrete
3	Know the properties of bitumen and their suitability.
4	Study the various tests carried out on Cement and Aggregates
5	Exposure on field tests on bitumen mixes

Course Outcome (s): After successful completion of the training the students will able to:

CO1	Assure the quality of coarse aggregate used in concrete.
CO2	Various workability tests on fresh concrete.
CO3	Ensure the strength characteristics of the given concrete.
CO4	Understand quality and grade check on bitumen.
CO5	Choose the correct grade bitumen for road works.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	1	1	-	1	1	-	1	2	2
CO2	3	2	2	2	3	1	1	-	1	1	-	1	2	2
CO3	3	2	2	2	3	1	1	-	1	1	-	1	2	2
CO4	3	2	2	2	3	1	1	-	1	1	-	1	2	2
CO5	3	2	2	2	3	1	1	-	1	1	-	1	2	2
CO (Avg)	3.00	2.00	2.00	2.00	3.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	2.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

LIST OF EXPERIMENTS

Test on Aggregates:

1. Specific gravity
2. Gradation of aggregate
3. Crushing strength
4. Abrasion value
5. Impact value
6. Water absorption
7. Flakiness and Elongation index

Test on Cement:

1. Fineness
2. Consistency
3. Initial and Final setting
4. Soundness
5. Compressive strength

Test on Fresh Concrete:

1. Slump cone test
2. Flow table
3. Compaction factor
4. Vee Bee test

Test on Hardened Concrete:

1. Compressive strength
2. Split tensile strength
3. Flexuretest
4. Non-destructive test by using Rebound Hammer

Test on Bitumen: (include Modified Bitumen)

1. Penetration
2. Softening point
3. Ductility
4. Viscosity

Tests on Bituminous Mixes:

1. Marshall stability and flow values (Demonstration Only)

Concrete Mix Design:

1. Mix design as per IS code

Code Book(S):

1	IS 383:1993 - Specification for Coarse And Fine Aggregates From Natural Sources For Concrete
2	IS 2386 (Part I to IV):1963- Methods of Test for Aggregates for Concrete, Part I: Particle Size and Shape
3	IS 1201 - 1220 (1978) - Methods for testing tars and Bituminous Materials
4	IRC SP 53:2010 - Guidelines on use of Modified Bitumen
5	IS 456:2000 - Plain and Reinforced Concrete - Code of Practice
6	IS 10262:2019 - Concrete Mix Proportioning – Guidelines

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Regulation 2018		Semester V	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PROJ	18CEP105L	MINOR PROJECT III	0	0	2	1

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report

Course Outcome (s) (COs): At the end of this course, learners will be able to:

Identify the requirement and develop the concepts or models through standard procedure and preparation of report

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	1	1	1	1	-	1	2	2
CO (Avg)	3.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	2.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Strategy(s)

- The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department

Regulation 2018		Semester V	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18MBM301L	ANALYTICAL AND LOGICAL THINKING SKILLS	0	0	2	1

Course Objective (s):

The purpose of learning this course is to:

1	Sharpen problem solving skills and to improve thinking capability of the students
2	Drive the students to use language with great commitment and cooperation
3	Expertise the creative thinking and presentation skills to meet the company needs

Course Outcome (s) (Cos):

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

CO1	Solve both analytical and logical problems in a fruitful manner
CO2	Organize and convey the information in such an incomparable way
CO3	Improve their presentation skills

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	-	-	-	-	-	-	-	-	2	-	-	-			
CO3	-	-	-	-	-	-	-	-	-	2	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	-	-	-	-	-	-	-	-			
CO (Avg)	3.00	-	-	-	-	-	-	-	2.00	2.00	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	Module - 1	6
Aptitude: Alligations or Mixtures - Blood Relations. **Communication:** How to set Goals - Interpersonal Relationships - JOHARI Window - Work & Business Etiquette		
UNIT II	**Module - 2**	**6**
Aptitude: Partnership - Statement and Assumptions. **Communication:** Transition to Corporate World - Career opportunities in Various Sectors and know your industry.		
UNIT III	**Module - 3**	**6**
Aptitude: Arithmetic and Geometric Progressions - Syllogisms. **Communication:** Time Management - Anger and Stress Management - Conflict Management.		
UNIT IV	**Module - 4**	**6**
Aptitude: Permutations and Combinations - Statements & Conclusions. **Communication:** Launch a Product - Telephonic Etiquette.		
UNIT V	**Module - 5**	**6**
Aptitude: Geometric Problems. **Communication:** Presentation Skills - Oral presentation and public speaking skills, Business presentations.		

Text Book (s)

1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015

Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC306T	FOUNDATION ENGINEERING	3	0	0	3

Prerequisite Course (s)

Soil mechanics

Course Objective (s): The purpose of learning this course is to:

1	Get basic knowledge of the geotechnical site investigation.
2	Learn pressure distribution below the footing and calculate bearing capacity of soil.
3	Understand the types of foundation and design principles
4	Discuss different types of pile foundation and its capacity
5	Study various earth pressure theories.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Enumerate methods of subsurface exploration and site investigation
CO2	Estimate the load carrying capacity of different types of foundation
CO3	Propose and design of shallow foundation
CO4	Calculate the load carrying capacity and design of pile foundation
CO5	Compute the earth pressure and stability of retaining walls

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	1	1	-	-	-	-	1	1	1
CO2	3	2	1	-	-	1	-	-	-	-	-	1	1	1
CO3	3	2	-	-	-	1	-	-	-	1	-	1	1	-
CO4	3	2	1	-	-	1	1	-	-	-	-	1	1	-
CO5	3	2	-	-	-	1	-	-	-	1	-	1	1	1
CO (Avg)	3.00	2.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
Approved On
16 OCT 2020
KARUR - 639 113

UNIT I	SITE INVESTIGATION AND SELECTION OF FOUNDATION	9

Objectives of Site Investigation - Stages and planning – Methods of Site Investigation - Depth of subsurface exploration and Spacing of bore holes - Geophysical methods – Electrical resistivity Method – Seismic refraction method – Standard penetration test – Static Cone Penetration test– Dynamic Penetration– Bore log report Requirements of good foundation - Factors governing location and depth of foundation-Types and Selection of foundation.

UNIT II	SHALLOW FOUNDATION	9

Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - Bearing Capacity from in-situ tests (SPT, SCPT and Plate load) - Settlement - Components of settlement - Determination of settlement of foundations on granular and clay deposits - Allowable settlements (As per IS Codal provisions) - Methods of minimising total and differential settlement – Correction on water table.

UNIT III	FOOTINGS AND RAFTS	9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision – Introduction on Machine Foundation.

UNIT IV	DEEP FOUNDATION	9

Consideration leading to selection of pile foundation - functions and types of pile foundation – Bearing capacity failure in piles - Seismic considerations in bearing capacity evaluation - Estimating load carrying capacity of piles by Static approach – Dynamic Formulae – Pile Load Test – Negative skin friction in piles – Use of under-reamed piles in expansive soils - Pile Group – Efficiency of Pile Group – Settlement of piles and pile groups - Methods of constructing - Pile foundations – Deep excavation – Pile foundation in water logged areas.

UNIT V	RETAINING WALLS	9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesion less and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.

Text Book (s)

1	Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
2	Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Reference (s)	
1	Joseph E Bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015.
2	Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014.

Code Book(s):

IS Code 6403: 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of Indian Standards, New Delhi.

IS Code 8009 (Part 1):1976 (Reaffirmed 1998) "Shallow foundations subjected to symmetrical static vertical loads", Bureau of Indian Standards, New Delhi.

IS Code 8009 (Part 2):1980 (Reaffirmed 1995) "Deep foundations subjected to symmetrical static vertical loading", Bureau of Indian Standards, New Delhi.

IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) "Concrete Piles" Bureau of Indian Standards, New Delhi. 8. IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) "Timber Piles", Bureau of Indian Standards, New Delhi.

IS Code 2911 (Part 3): 1979 (Reaffirmed 1997) "Under Reamed Piles", Bureau of Indian Standards, New Delhi.

IS Code 2911 (Part 4): 1979 (Reaffirmed 1997) "Load Test on Piles", Bureau of Indian Standards, New Delhi.

IS Code 1904: 1986 (Reaffirmed 1995) "Design and Construction of Foundations in Soils", Bureau of Indian Standards, New Delhi.

IS Code 2131: 1981 (Reaffirmed 1997) "Method for Standard Penetration test for Soils", Bureau of Indian Standards, New Delhi.

IS Code 2132: 1986 (Reaffirmed 1997) "Code of Practice for thin – walled tube sampling for soils", Bureau of Indian Standards - New Delhi.

IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.

IS Code 14458 (Part 1): 1998 "Retaining Wall for Hill Area – Guidelines, Selection of Type of Wall", Bureau of Indian Standards, New Delhi.

IS Code 14458 (Part 2): 1998 "Retaining Wall for Hill Area – Guidelines, Design of Retaining/Breast Walls", Bureau of Indian Standards, New Delhi.

IS Code 14458 (Part 3): 1998 "Retaining Wall for Hill Area – Guidelines, Construction Of Dry Stone Walls", Bureau of Indian Standards, New Delhi.

Regulation 2018		Semester VI	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC307T	DESIGN OF REINFORCED CONCRETE STRUCTURES	3	0	0	3

Prerequisite Course (s)

Strength of Materials, Analysis of Structures

Course Objective (s): The purpose of learning this course is to:

1	Develop an understanding on the basic concepts in the behavior and design of reinforced concrete systems and elements using limit state method.
2	Learn the design of slab using virtual work method and design of staircase
3	Introduce the design principles of RC members for shear, bond, and torsion.
4	Introduce the concepts in the design of RC Column design.
5	Accrue knowledge in the concept of RC footings.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Design flexural members using limit state method under different loading conditions.
CO2	Design of slab for various end condition and design of staircase.
CO3	Design flexural members for shear, bond, and torsion.
CO4	Design RC columns of any cross section with different end conditions.
CO5	Design the footing according to column positioning

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO2	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO3	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO4	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO5	3	2	1	-	-	1	1	-	-	1	-	1	2	1
CO (Avg)	3.00	2.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG. Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

UNIT I	INTRODUCTION	9

Objective of structural design - Types of reinforcements - Stress strain curve for concrete, reinforcing steel - Type of Loads on Structures and Load combinations - RCC Structural Design Process - Concept of elastic method, ultimate load method and limit state method - Advantages– Limit state philosophy and assumptions as detailed in IS code – Design of codes and specification - Analysis and design of singly and doubly reinforced rectangular and flanged beams.

UNIT II	DESIGN OF SLABS AND STAIRCASE	9

Concepts – Assumptions –Methods of analysis - Application of virtual work method to square, rectangular slabs - Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects- Design of Flat slab- Types of Staircases – Design of dog-legged Staircase.

UNIT III	DESIGN OF SHEAR, TORSION	9

Behaviour of RC members in Bond and anchorage – Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion – Design of RC members for combined Bending, Shear and Torsion.

UNIT IV	DESIGN OF COLUMNS	9

Types of columns – Eccentricity – Analysis and design of short column for axial, Uniaxial and Biaxial bending - Design of slender column.

UNIT V	DESIGN OF FOOTING	9

Design of axially and eccentrically loaded rectangular footing - Design of combined rectangular footing for two columns only

Text Book (s)

1	Unnikrishnan Pillai and DevdassMenon - Reinforced Concrete Design - Tata McGraw Hill PublishingCompany Ltd. 2016.
2	N.KrishnaRaju "Design of Reinforced Concrete Structures: IS:456-2000, Fourth edition, CBS Publishers and distributors, Pvt. Ltd.2016

Reference (s)

1	Punmia B.C. Ashok K. Jain and Arun K. Jain, Limit State design of Reinforced Concrete, Laxmi Publications (P) Ltd., New Delhi, 2016.
2	Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2013.
3	Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2017
4	Purushothaman.P "Reinforced Concrete Structural Elements" Tata McGraw Hill Publishing Co. Ltd., 2007.

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
Approved On
16 OCT 2020
KARUR - 639 113

Code Book(S):	
1	IS 456: 1978 Design Aids for Reinforced Concrete to IS 456: 1978, BIS, New Delhi
2	IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi
3	SP 6(I) – 1964, "Handbook for Structural Engineers".
4	SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978.
5	SP 34:1987 Handbook of Concrete Reinforcement and Detailing.

Regulation 2018		Semester VI	Total Hours			60
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC308L	SURVEY CAMP	0	0	4	2

Prerequisite Course (s)

Surveying, Surveying Laboratory

Course Objective (s): The purpose of learning this course is to:

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than five members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 30 acres. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Course Outcome (s): After successful completion of the training the students will able to:

CO1	Measure the length and area of field by using Modern Equipment.
CO2	Obtain the horizontal and vertical angles in field by using Theodolite.
CO3	Know the earth work required for levelling.
CO4	Know how to rectify the errors in measurement while measuring in the field.
CO5	Give the practical exposure about the survey work before the construction.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	2	1	1	-	1	1	-	1	2	1
CO2	3	2	2	-	2	1	1	-	1	1	-	1	2	1
CO3	3	2	2	-	2	1	1	-	1	1	-	1	2	1
CO4	3	2	2	-	-	1	1	-	1	1	-	1	2	1
CO5	3	2	2	-	-	1	1	-	1	1	-	1	2	1
CO (Avg)	3.00	2.00	2.00	0.00	2.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

LIST OF EXPERIMENTS

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traversing
   i. Theodolite Traversing
   ii. Traversing using GPS
2. Contouring
   i. Radial contouring - Radial Line at Every 30 Degree and Length not less than 60 Meter on each Radial Line
   ii. Block Level/ By squares of size at least 100 Meter x 100 Meter at least 20 Meter interval
3. Longitudinal section and cross section of road alignment for a Length of not less than 1 Kilo Meter at least L.S. at every 30M and C.S. at every 90 M
4. Use of GPS to determine latitude and longitude and locate the survey camp location.
5. Setting out of simple curve
6. Determination of distance and difference in elevation between two inaccessible points
7. Determination of elevation of an object using single plane method when base is accessible/inaccessible.
8. Calculation of area and volume using modern equipments

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS)
Board of Civil Engg.
Approved On
16 OCT 2020
KARUR

Regulation 2018		Semester VI	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC309L	COMPUTER AIDED DESIGN AND DRAFTING LABORATORY	0	0	2	1

Prerequisite Course (s)

Analysis of Structures, Design of Reinforced Concrete Structures, Design of Steel Structures

Course Objective (s): The purpose of learning this course is to:

1	Provide Knowledge on Design and Detailing of Slab and Staircase
2	Familiarize on Design and Detailing of Beam
3	Expertise on Design and Detailing of Column and Footing
4	Know the Concepts of Tension Member with Steel Connection
5	Familiarize on Design of Compression Member

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Understand the Different end Boundary Condition for Slab and Staircase.
CO2	Familiarize the Concept Adopted in Different Types of Column and Footing.
CO3	Design Flexural Members Using Limit State Method Under Different Loading and End Conditions.
CO4	Have Fundamental Understanding of Tension Member Using Bolted and Welded Connection.
CO5	Solve Various Elements of Compression Member.

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	1	1	-	-	1	-	1	2	1
CO2	3	2	1	-	1	1	1	-	-	1	-	1	2	1
CO3	3	2	1	-	1	1	1	-	-	1	-	1	2	1
CO4	3	2	1	-	1	1	1	-	-	1	-	1	2	1
CO5	3	2	1	-	1	1	1	-	-	1	-	1	2	1
CO (Avg)	3.00	2.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	2.00	1.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

M.KUMARASAMY COLLEGE OF ENGG. (AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

LIST OF EXPERIMENTS	30

1. Design and Detailing of Slab with boundary conditions
2. Design and Detailing of T beam
3. Design and Detailing of Singly, Doubly Reinforced Beam
4. Design and Detailing of Axial, Uniaxial, Biaxial column
5. Design and Detailing of Dog legged Staircase
6. Design and Detailing of Isolated Footing
7. Design of Tension Member with Bolted and Welded Connection
8. Design of Laced and Battened Column
9. Design of Slab Base
10. Design of Purlin

Reference (s):

1	Unnikrishnan Pillai and DevdassMenon - Reinforced Concrete Design - Tata McGraw Hill PublishingCompany Ltd. 2016.
2	KrishnaRaju N, "Design of Reinforced Concrete Structures: IS:456-2000, Fourth edition, CBS Publishers and distributors, Pvt. Ltd.2016
3	PunmiaB.C. Ashok K. Jain and Arun K. Jain, Limit State design of Reinforced Concrete, Laxmi Publications (P) Ltd., New Delhi, 2016.
4	Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2013.
5	Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2017

Code Book(s):

1.	IS 456: 1978 Design Aids for Reinforced Concrete to IS 456: 1978, BIS, New Delhi
2.	IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi
3.	SP 6(I) – 1964, "Handbook for Structural Engineers".
4.	SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978.
5.	SP 34:1987 Handbook of Concrete Reinforcement and Detailing.
6.	IS: 800 – 2007, "General Construction in Steel" - Code of Practice.
7.	IS 875- 2015"Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures - Part 3: Wind Loads".

M.KUMARASAMY COLLEGE OF ENGG.(AUTONOMOUS) Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Regulation 2018		Semester VI	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PROJ	18CEP106L	MINOR PROJECT IV	0	0	2	1

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

Identify the suitable idea and methods to develop the project idea into demonstrative or to explain the concepts in standard procedure and to prepare report

Course Outcome (s) (COs): At the end of this course, learners will be able to:

Identify the requirement and develop the concepts or models through standard procedure and preparation of report

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	2	1	1	1	1	1	1	2	2
CO (Avg)	3.00	2.00	3.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Strategy(s)

- The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction.
- The student will be evaluated through continuous assessment by a panel formed under the approval of head of the department

M.KUMARASAMY COLLEGE OF ENG... Board of Civil Engg. Approved On 16 OCT 2020 KARUR - 639 113

Regulation 2018		Semester VI	Total Hours			30
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
M	18MBM302L	EMPLOYABILITY SKILLS AND PRACTICES	0	0	2	1

Course Objective (s):

The purpose of learning this course is to:

1	Learn the application of mathematical or statistical models to different real-world contexts
2	Focus on writing & speaking skills through vigorous practices.
3	Enhance soft skills and analytical ability of students
4	Defeat the fear while communicating in group and to master the effective communication

Course Outcome (s) (Cos):

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

CO1	Solve both analytical and logical problems in a productive manner
CO2	Launch their ability of comprising and delivering the information
CO3	Upgrade their communication quality in near future

CO-PO Mapping

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	-	-	-	-	-	-	-	-	3	-	-	-			
CO3	-	-	-	-	-	-	-	-	-	3	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	-	-	-	-	-	-	-	-			
CO (Avg)	3.00	-	-	-	-	-	-	-	3.00	3.00	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	Module - 1	6
Aptitude: Time and Distance (Speed, Streams) - Problems on Trains - Arrangements and BloodRelations. **Communication:** Job Application - Cover letter,Bio-data,Resume& CV building.		
UNIT II	Module - 2	6
Aptitude: Time and Work - Pipes & Cisterns - Situation Reaction Test & Data Interpretations. **Communication:** Writing practices on circulars, notices, memos, Agenda preparation and Minutes of meeting.		
UNIT III	Module - 3	6
Aptitude: Ages - Averages - Probability - Profit and Loss. **Communication:** Email Etiquette - Essay writing.		
UNIT IV	Module - 4	6
Aptitude: Mensuration - SI & CI - Cause and Effect Analysis - Statement, Assumptions & Conclusions. **Communication:** Group Discussion and guidelines.		
UNIT V	Module - 5	6
Aptitude: Permutation and Combinations - Partnership - Alligations or Mixtures. **Communication:** Interview skills - General instructions, Review of interview questions, Mock Interviews.		

Text Book (s)

1	Dr.R.S.Aggarwal, "Quantitative Aptitude", S. Chand & Company Limited, 2015
2	Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2015

Regulation 2018		Semester VII	Total Hours			75
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC401J	ESTIMATION AND QUANTITY SURVEYING	3	0	2	4

Prerequisite Course (s)

Construction Materials and Techniques, Design of Reinforced Concrete Structures

Course Objective (s): The purpose of learning this course is to:

1	Identify various items of work in a building and calculate their quantities using appropriate methods.
2	Understand the concepts behind the preparation of estimate of the various civil engineering works.
3	Impart the knowledge on basic concepts related to estimate preparation.
4	Analyse the rate of a work item according to the specification.
5	Understand the terminologies and concepts behind the valuation of properties, depreciation and time value of money.

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Prepare various types of estimation and find out the quantity of works involved.
CO2	Carry out analysis of rates and bill preparation using spreadsheets.
CO3	Prepare specifications for various items of construction works
CO4	Estimate the quantity of works involved in road works, water supply and sanitary works.
CO5	Estimate the value of buildings

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	1	1	-	-	-	-	1	3	2
CO2	3	2	1	-	1	1	1	-	-	-	-	1	3	2
CO3	3	2	1	-	1	1	1	-	-	-	-	1	3	2
CO4	3	2	-	-	1	1	1	-	-	-	-	1	3	2
CO5	3	2	1	-	1	1	1	-	-	-	-	1	3	2
CO (Avg)	3.00	2.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	3.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

UNIT I	ESTIMATE OF BUILDING	9

Types of estimates – Units of measurements – Methods of estimates – Advantages. Quantity estimate for load bearing and framed structures - brick work and RCC works only, Steel requirement and Bar bending schedule - Calculation of quantities of earth work excavation, brickwork, PCC, RCC, Plastering, white washing, colour washing and painting/varnishing for shops and residential building with flat roof.

UNIT II	ESTIMATE OF OTHER STRUCTURES	9

Estimating of septic tank, soak pit – Retaining wall– Culvert - estimate of bituminous and cement concrete roads.

UNIT III	ANALYSIS OF RATES AND SPECIFICATIONS	9

Data – Schedule of rates – Analysis of rates – Specifications – sources – General and Detailed specifications-Material Calculations for each work- Material cost.

UNIT IV	VALUATION	9

Necessity – Different methods of valuation of a building – capitalized value – Depreciation – Escalation – Value of building – Calculation of Standard rent - Mortgage - lease.

UNIT V	REPORT PREPARATION	9

Principles for report preparation – report on estimate of residential and industrial building – Roads – Water supply and sanitary installations.

LIST OF EXPERIMENTS	30

The following list of experiments can be carried out by using software tools:

1. Estimation of residential building
2. Estimation of framed structures
3. Estimation of Septic tanks and soak pit
4. Estimation of Industrial Building
5. Estimation of Box Culvert
6. Estimation of Retaining wall
7. Estimation of Irrigation work
8. Estimation of Road
9. Valuation of residential building
10. Valuation of industrial building

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Text Book (s)	
1	Dutta.B.N, "Estimating and Costing in Civil Engineering", UBS Publishers and Distributors Pvt. Ltd., 2003.
2	Chakraborti M, "Estimation, Costing, Specification and Valuation in Civil Engineering (including Computer estimation)", 2001.
Reference (s)	
1	Kohli, D.D and Kohli,R.C, "A text book of Estimating and Costing (Civil)", S.Chand and Company Ltd., 2004.
2	Rangwala S C, "Estimating, Costing and Valuation", Charotar Publishing House", 2001.
3	Estimating and Costing: Including Quantity Surveying, Tendering and Evaluation Kataria and Sons, 2010

Regulation 2018		Semester VII	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PCC	18CEC402T	CONSTRUCTION ENGINEERING AND MANAGEMENT	3	0	0	3

Prerequisite Course (s)

-

Course Objective (s): The purpose of learning this course is to:

1	Learn the principles of management
2	Understand the fundamental principles of construction management and resource planning.
3	Study the scheduling methods, execution procedure and financial control process.
4	Extend resource allocation and work execution sequence
5	Utilise quality and safety in construction

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Identify the principles of management hierarchy of organization
CO2	Extend the principles to planning and cash flow
CO3	Compute the process of planning and scheduling methods
CO4	Describe about basic ability to plan, control and monitor construction projects with respect to time and cost
CO5	Outline the safety and quality procedure in construction

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	1	1	-	-	-	1	1	2	2
CO2	3	2	-	-	-	1	1	-	-	-	1	1	2	2
CO3	3	2	-	-	-	1	1	-	-	-	1	1	2	2
CO4	3	2	-	-	-	1	1	-	-	-	1	1	2	2
CO5	3	2	-	-	-	1	1	-	-	-	1	1	2	2
CO (Avg)	3.00	2.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	2.00	2.00

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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UNIT I	PRINCIPLES OF CONSTRUCTION MANAGEMENT	9

Definition – importance – functions of construction management – construction participants – Role and responsibilities of client, construction management consultant, architect and contractor – organization – types of organizations - hierarchy of organization

UNIT II	CONSTRUCTION PLANNING	9

Basic concepts in the development of construction plans – importance of construction planning – different types of construction project – project life cycle – project feasibility report – techno economic feasibility report – detailed project report -construction stages - Funds: cash flow,sources of funds

UNIT III	METHODS OF CONSTRUCTION MANAGEMENT	9

Scheduling methods - Bar chart (Gantt chart) -Concepts of network -Network planning methods CPM and PERT - identification of critical path, project duration and total float-Management by network analysis - preparation of charts for staff, labour, material, plant and machinery requirements.

UNIT IV	EXECUTION OF WORKS	9

Choice of technology - planning and organizing construction site and resources - Manpower: planning, organizing, staffing, motivation - Materials: concepts of planning, procurement and inventory control -Contractors: Contract system – types of engineering contracts – specifications, documents, procedures, conditions.

UNIT V	PROJECT MONITORING AND CONTROL	9

Basics of modern project management - use of Building Information Modelling (BIM) in project management. - Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection. - Safety at construction site – Accidents: causes, effects and preventive measures - costs of accidents - occupational health problems in construction

Text Book (s)

1	Seetharaman.S, "Construction Engineering and Management", UmeshPublications,2017.
2	SangaReddy,S., and Meyyappan, PL., "Construction Management", KumaranPublications, Coimbatore, 2004.

Reference (s)

1	Varghese .P.C., "Building Construction", Prentice Hall India, 2007.
2	Chitkara,K.K., "Construction Project Management", Tata McGraw-Hill Publishing co,2014
3	Punmia.B.C., Khandelwal.K.K., "Project Planning with PERT and CPM", Laxmi Publications, 2016.
4	Jha, Kumar Neeraj, "Construction Project management, Theory and Practice", Pearson Education India, 2015.

Regulation 2018		Semester __	Total Hours			45
Category	Course Code	Course Name	Hours / Week			C
			L	T	P	
PEC	18CEE022T	METRO SYSTEM AND CIVIL ENGINEERING APPLICATION	3	0	0	3

Prerequisite Course (s)

Highway and Railway Engineering

Course Objective (s): The purpose of learning this course is to:

1	Impart knowledge on metro system
2	Describe the metro construction systems
3	Outline the metro electrification systems
4	Impart knowledge on metro rolling stock
5	Learn about metro signalling system

Course Outcome (s) (COs): At the end of this course, learners will be able to:

CO1	Understand the necessity of metro system for urban transport
CO2	Acquire the construction of metro system
CO3	Understand metro electrification systems
CO4	Gather information on metro rolling stock
CO5	Analyse on metro signalling system

CO-PO Mapping

COs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	1	1	-	-	-	-	1	2	1
CO2	3	2	-	-	-	1	1	-	-	-	-	1	2	1
CO3	3	2	-	-	-	1	1	-	-	-	-	1	2	1
CO4	3	2	-	-	-	1	-	-	-	-	-	1	2	1
CO5	3	2	-	-	-	1	-	-	-	-	-	1	2	1
CO (Avg)	3.00	2.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00

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UNIT I	INTRODUCTION TO METRO RAIL SYSTEM	9
Overview of Metro Systems-Need for Metros-Routing studies-Basic Planning and Financials-Construction methods for Elevated and underground Stations, Viaduct spans and bridge, Underground tunnels; Depots; Commercial and Service buildings.		
UNIT II	**METRO CONSTRUCTION SYSTEM**	**9**
Initial Surveys and Investigations-Basics of Construction Planning and Management, Construction Quality and Safety Systems- Traffic integration, multimodal transfers and pedestrian facilities-Environmental and social safeguards-Track systems-permanent way.		
UNIT III	**METRO SIGNALLING AND CONTROL SYSTEM**	**9**
Signalling systems-Automatic fare collection-Operation Control Centre (OCC and BCC); SCADA and other control systems-Platform Screen Doors.		
UNIT IV	**METRO ROLLING STOCK**	**9**
Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators.		
UNIT V	**TRACTION SUBSTATIONS FOR METRO SYSTEMS**	**9**
Traction Power-Substations: TSS and ASS-Power SCADA-Standby and Backup systems Green buildings-Carbon credits and clear air mechanics.		
Text Book (s)		
1	Edwards.J.T, Civil Engineering for Underground Rail Transport, Elsevier, 2015.	
2	Marcelo Blumenfeld, A systems approach to developing a new metro for megalopolis, ICE Virtual Library.	
Reference (s)		
1	UmeshRai.B, Handbook of Research on Emerging Innovations in Rail Transportation Engineering, May, 2016	

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