Form A-7
(See OA-14 of Part A)
Proforma for the submission of the minutes of the Board of Studies

GOA UNIVERSITY

B. E. - CIVIL ENGINEERING

1. **Revised Scheme RC 2019-20 - Annexure A**

2. **Syllabus in the Subjects SEM-3 and SEM- 4 Annexure B**

3. **Theory Question Paper Pattern - Annexure -C**

Form A-7
(See OA-14 of Part A)
Proforma for the submission of the minutes of the Board of Studies

Part A.

i. Recommendations regarding courses of study in the subject or group of subjects at the undergraduate level:

- **Syllabus in the subjects in IIIrd and IVth Semester (i.e. Second Year) in B. E. (Civil Engineering) for the Revised Scheme RC 2019-20 enclosed as Annexure – B.**

ii. Recommendations regarding courses of study in the subject or group of subjects at the postgraduate level:

----- NIL -----

Part B

i. Scheme of Examinations at undergraduate level:

- **IIIrd to VIIIth Semester (i.e. Second, Third and Final Year) in B.E. (Civil Engineering) Revised Scheme RC 2019-20 enclosed as Annexure – A.**

ii. Panel of examiners for different examinations at the undergraduate level:

----- NIL -----

iii. Scheme of Examinations at postgraduate level:

----- NIL -----

iv. Panel of examiners for different examinations at post-graduate level:

----- NIL -----

Part C.

i. Recommendations regarding preparation and publication of selection of reading material in the subject or group of subjects and the names of the persons recommended for appointment to make the selection:

----- NIL -----

Part D

i. Recommendations regarding general academic requirements in the Departments of University or affiliated colleges:

----- NIL -----

ii. Recommendations of the Academic Audit Committee and status thereof:

----- NIL -----

Part E.

i. Recommendations of the text books for the course of study at undergraduate level:

- **Included in the syllabus of respective subjects in IIIrd and IVth Semester (i.e. Second Year) in B. E. (Civil Engineering) for the Revised Scheme RC 2019-20. Refer enclosed Annexure – B.**

ii. Recommendations of the text books for the course of study at post graduate level:

----- NIL -----

Part F.

Important points for consideration/approval of Academic Council

i. The important points/recommendations of BoS that require consideration/approval of Academic Council (points to be highlighted) as mentioned below

a) **Theory Question Paper Pattern (Enclosed as Annexure – C).**

b) -----

ii. The declaration by the chairman that the minutes were readout by the Chairman at the meeting itself.

Date: 17/5/19
Place: Farmagudi

Signature of the Chairman
Dr. Ganesh Hegde

Dr. Ganesh Hegde Ph.D.(IIT Bombay)
Professor, Civil Engg. Dept.
Goa College of Engineering, (Govt. of Goa)
Farmagudi - Ponda, Goa 403 401

Part G. The Remarks of the Dean of the Faculty

i) The minutes are in order

ii) The minutes may be placed before the Academic Council with remarks if any.

iii) May be recommended for approval of Academic Council.

iv) Special remarks if any.

Date: 17/05/19
Place Farmagudi

Signature of the Dean

PROFESSOR
Computer Engineering Department
Goa College of Engineering
(Government of Goa)
Farmagudi, Ponda-Goa

Form A-7
(See OA-14 of Part A)
Proforma for the submission of the minutes of the Board of Studies

ANNEXURE A

SECOND YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – III

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV310	Mechanics of Solids	3	1	--	3	100	25	25	--	--	150	4
CV320	Fluid Mechanics	3	1	--	3	100	25	25	--	--	150	4
CV330	Engineering Geology	3	--	--	3	100	25	--	--	--	125	3
CV340	Building Materials and Construction	3	1	--	3	100	25	25	--	--	150	4
CV350	Computer Aided Civil Engineering Drawing	2	1	2	4	100	25	25	--	--	150	4
CV360	Mechanics of Solids Lab	--	--	2	--	--	--	--	50	--	50	1
CV370	Material Testing Lab	--	--	2	--	--	--	--	50	--	50	1
HM001	Technical Communication	2	--	--	--	--	--	75	--	--	75	2
AC390	Mathematics-I & II (Bridge Course*)	2	--	--	--	--	--	--	--	--	--	0
	TOTAL	**18**	**4**	**6**	**--**	**500**	**125**	**175**	**100**	**--**	**900**	**23**

*Bridge course is only for direct second year admitted candidates

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

SECOND YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – IV

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV410	Surveying & Geomatics	3	1	--	3	100	25	--	--	--	125	4
CV420	Hydraulic Engineering	3	1	--	3	100	25	--	--	--	125	4
CV430	Structural Analysis	3	1	--	3	100	25	25	0	25	175	4
CV440	Transportation Engineering	3	1	--	3	100	25	--	--	--	125	4
CV450	Geotechnical Engineering	3	--	--	3	100	25	--	--	--	125	3
CV460	Surveying & Geomatics Lab	--	--	2	--	--	--	25	50	--	75	1
CV470	Fluid Mechanics & Hydraulics Lab	--	--	2	--	--	--	25	50	--	75	1
HM003	Economics for Engineers	3	--	--		100	25	--	--	--	125	3
	TOTAL	**18**	**4**	**4**	**--**	**600**	**150**	**75**	**100**	**25**	**950**	**24**

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

THIRD YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – V

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV510	Concrete Technology	3	1	--	3	100	25	--	--	--	125	4
CV520	Environmental Engineering	3	1	--	3	100	25	--	--	--	125	4
CV531	Pavement Design and Construction	3	--	--	3	100	25	--	--	--	125	3
CV532	Numerical methods											
CV533	Environmental Impact Assessment and Life Cycle Analysis											
CV534	Foundation Engineering											
CV535	Occupational Safety and Health Assessment											
CV541	Advanced Structural Analysis	3	--	--	3	100	25	--	--	--	125	3
CV542	Ground Improvement Techniques											
CV543	Green Building											
CV544	Rural Water Supply & Onsite Sanitation System											
CV545	Advanced Surveying											
CV560	Concrete Technology and Transportation Engineering Lab	--	--	2	--	--	--	25	50	--	75	1
CV570	Geotechnical and Environmental Engineering Lab	--	--	2	--	--	--	25	50	--	75	1
**	Open Elective	3	--	--	3	100	25	--	--	--	125	3
HM005	Entrepreneurship & IPR	3	--	--	3	100	25	--	--	--	125	3
	TOTAL	**18**	**2**	**4**	--	**600**	**150**	**50**	**100**	--	**900**	**22**

LEGEND

L	T	P	O	Th	TW	IA
Lecture	Tutorial	Practical	Oral	Theory	Term Work	Internal Assessment

THIRD YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – VI

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV610	Design of Reinforced Concrete Structures	3	1	--	3	100	25	25	--	--	150	4
CV620	Design of Steel Structures	3	1	--	3	100	25	25	--	--	150	4
CV631	Geosynthetics and Application	3	--	--	3	100	25	--	--	--	125	3
CV632	Finite Element Method											
CV633	Air and Noise Pollution and Control											
CV634	Advanced Engineering Geology.											
CV635	Remote Sensing & GIS											
CV641	Bridge Engineering	3	--	--	3	100	25	--	--	--	125	3
CV642	Construction Equipments & Automation											
CV643	Structural Dynamics											
CV644	Advanced Geotech Engg											
CV645	Ground Water Engineering											
CV 670	Structural Engineering Lab	--	--	2	--	--	--	25	50	--	75	1
**	Open Elective	3	--	--	3	100	25	--	--	--	125	3
HM011	Estimation & Costing	3	1	--	3	100	25	25	--	--	150	4
	TOTAL	**18**	**3**	**2**	**--**	**600**	**150**	**100**	**50**	**--**	**900**	**22**

LEGEND

L	T	P	O	Th	TW	IA
Lecture	Tutorial	Practical	Oral	Theory	Term Work	Internal Assessment

FOURTH YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – VII

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV710	Construction Engineering and Management	3	1	--	3	100	25	--	--	--	125	4
CV721	Structural Repair and Retrofitting	3	--	--	3	100	25	--	--	--	125	3
CV722	Design of Prestressed Concrete structures											
CV723	Soil dynamics and Machine Foundations											
CV724	Advanced Steel Structures											
CV725	Biological Processes for Contaminant Removal											
CV730	Advance Materials Testing Lab	--	--	2	--	--	--	25	50	--	75	1
**	Open Elective	3	--	--	3	100	25	--	--	--	125	3
CV740	Internship*	--	--	6		--	--	50	--	50	100	3
CV750	Project Work - Phase I	--	--	6		--	--	50	--	75	125	3
	TOTAL	**09**	**01**	**14**		**300**	**75**	**125**	**50**	**125**	**675**	**17**

*at 7th Semester 8 weeks internship/training// Research Assistantship-(in the month of September & October)

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

FOURTH YEAR CIVIL ENGINEERINGENGINEERING COURSE

SCHEME OF INSTRUCTION AND EXAMINATION REVISED COURSE 2019-2020

SEMESTER – VIII

Course Code	Nomenclature of the Course	Scheme of Instruction Hrs/Week			Scheme of Examination							
		L	T	P	Duration (Hrs)	Marks						Credits
						Th	IA	TW	P	O	Total	
CV810	Hydraulics, Hydrology and Water Resources Engineering	3	--	--	3	100	25	--	--	--	125	3
CV821	Architectural Engineering	3	--	--	3	100	25	--	--	--	125	3
CV822	Earthquake Engineering											
CV823	Structural design of Foundations											
CV824	Solid & Hazardous Waste Management											
CV825	High Speed Rail Engineering											
CV830	Elective - NPTEL / MOOC / SWAYAM	3	--	--	--	--	--	50	--	50	100	3
CV840	Project Work - Phase II	--	--	18	--	--		200	--	200	400	9
	TOTAL	**9**	**0**	**18**	**--**	**200**	**50**	**250**	**--**	**250**	**750**	**18**

If required additionally at 8th Sem (before start of semesteror during vacation) 4 weeks of Internship/ Training/ Research Assistantship can be provided to deserving students to enhance their employability -(in the month of January)

LEGEND

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
O	Oral
Th	Theory
TW	Term Work
IA	Internal Assessment

Total Credits for the four-year Engineering course= 160

Total Marks for the four-year Engineering course= 6425

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(See OA-14 of Part A)
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ANNEXURE B

MECHANICS OF SOLIDS					
Course Code	**CV310**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 150 marks	**25**	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of:

1. Understand the principles of material behaviour.
2. Apply the elasticity principles to beams, columns, springs and cylinders.
3. Analyse the state of material under various stresses and strains.
4. Design common elements such as columns, beams and cylinders using elastic principles.

Course Outcomes:

The student will be able to:

CO1	Learn fundamental concepts of stress, strain and deformation.
CO2	Apply elasticity principles to beams, columns, springs and cylinders.
CO3	Analyse and Assess the ability of materials to resist failure.
CO4	Design simple elements such as columns, beams and cylinders.

UNIT -1	
Simple Stresses and Strains- Concept of stress and strain, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them –Bars of varying section – composite bars – Temperature stresses. ***Compound Stresses and Strains***- Two dimensional system, stress at a point on aplane, principal stresses and principal planes, Mohr circle of stress. Two dimensional stress-strain system, principal strains and principal axis of strain.	11Hrs
UNIT -2	
Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams. BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. ***Flexural Stresses-Theory of simple bending*** – Assumptions, Derivation of bending equation, , Neutral axis, Determination of bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections. Core or Kernel of the sections. ***Shear Stresses***- *Derivation of formula* – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.	11 Hrs

UNIT -3	
Trusses-Trusses and their deformations, Statically Determinate and Indeterminate Trusses, Analysis of statically determinate trusses ***Strain Energy*** Resilience Gradual, sudden, impact and shock loadings simple applications. ***Slope and deflection***- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.	10 Hrs
UNIT -4	
Thin & Thick Cylinders - Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder subjected to internal pressures. *Springs:* Analysis of closely coiled helical springs. ***Structural stability***-Stability of columns, Euler's and Rankine's Formula, end conditions and effective length factor, Columns with eccentric and lateral load	10 Hrs
Note: Tutorials shall comprise of solving numerical examples on the course contents & presentations on practical applications of course concept. Term work shall include at least five assignments based on above syllabus and study & reporting on application of IOT and Sensor Technology in identifying stresses, forces, deflections in existing structures.	

TEXT BOOKS:	
1	Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
2	Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
3	Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
4	Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf– TMH 2002.
5	Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
REFERENCES:	
1	Popov E. P. Engineering Mechanics of solids, Prentice Hill.
2	Ramamrutham S. Strength of materials, Dhanpat Rai Publishing Co. Pvt. Ltd.
3	Subramanian R., Strength of Materials, Oxford University Press, New Delhi
4	Gere, J. M., and TimoshenkoS. P. *Mechanics of Materials.* 5th ed. Boston: PWS Kent Publishing, 1970

SURVEYING & GEOMATICS					
Course Code	**CV410**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Tacheometric, Geodetic, Hydro graphic surveying for measurement of distance & height, elimination of errors.
2. Preliminary survey and its applications in setting out of curves, buildings, culverts and tunnels.
3. Concept and application of surveying in triangulation and trigonometric leveling.
4. Advanced surveying techniques and instruments such as use of Remote Sensing, Total Station, GPS, GIS etc. in surveying
5. Contour maps and use it effectively for area and volume calculations

Course Outcomes:

The student will be able to:

CO1	Learn and apply setting principles of setting out works.
CO2	Learn the concepts of the global positioning system, GIS and remote sensing
CO3	Prepare and interpret contour plots.
CO4	Identify sources of errors and work with accuracy and precision in field.

UNIT -1	11 HRS
Introduction to Surveying: Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, corrections to bearings Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; **Contouring:** Characteristics, methods, uses; areas and volumes.	
UNIT -2	11 HRS
Triangulation and Trilateration: Tacheometric survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control, methods -triangulation network, Signals. Baseline, choices, instruments and accessories, extension of base lines corrections, Satellite station, reduction to centre, Intervisibility of height and distances, Corrections for geodesy **Trigonometric leveling** - Axis single corrections.	
UNIT -3	10 HRS
Curves : Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves **Setting out works:** general horizontal and vertical control, setting out of Foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite. Setting out of sewer line, culvert, use of laser for works. Setting out center line for tunnel, transfer of levels to underground work project / route survey for Bridge, dam and canal. Checking verticality of high rise structures.	

UNIT -4	10HRS
Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station , Parts of a Total Station, Accessories, Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems-Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations. **Photogrammetry Surveying**: Basic concepts& Applications, Use of Drones in surveying **Hydrographic Surveying**: Basic concepts& Applications **Remote sensing & GIS:** Basic concepts & Applications	
Note: Tutorials shall comprise of solving at least 5 numerical examples on the course contents & presentations on practical applications of course concept and study on latest modern and electronic equipments used for surveying.	

TEXT BOOKS:	
1	Surveying, Vol I & II, B C Punmia, A K Jain, A K Jain, Laxmi Publications (P) Ltd
2	Surveying, Vol I & II, S K Duggal, McGraw Hill Publications
3	Surveying &Levelling, N NBasak, McGraw Hill Publications
REFERENCE BOOKS:	
4	Plane and Geodetic Surveying, Vols. I and II; Clark D., C.B.S. Publishers and Distributors, Delhi, Sixth Edition
5	Advanced Surveying, Total Station GPS And Remote Sensing,SatheeshGopi, Rasathish kumar, N. Madhu, Pearson Education.

HYDRAULIC ENGINEERING					
Course Code	**CE 420**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**03**	**01**	**00**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Various hydraulic engineering problems like open channel flows and hydraulic machines.

2.Theory and practice of problems in hydraulic engineering

Course Outcomes:

The student will be able to:

CO1	Apply their knowledge of fluid mechanics in addressing problems in open channels.
CO2	analyse problems in uniform, gradually and rapidly varied flows in steady state conditions
CO3	Possess knowledge in hydraulic machines (pumps and turbines).
CO4	Decide and suggest types of pumps and hydraulic machines for different applications

UNIT -1	12 HRS
Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, Velocity Distribution of channel section. **Uniform Flow in channels-** Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient .Most economical rectangular trapezoidal and Circular section **Non-Uniform Flow in channels** - Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Hydraulic Jump-Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types,applications and location of hydraulic jump. Energy dissipation and other uses.	
UNIT -2	10 HRS
Impact of Free Jets: Application of momentum equation on stationary, hinged and moving plates placed vertical and inclined - flat and curved vanes. Series of vanes mounted on a wheel. **Turbines:** Classification and working of Hydraulic turbines –Impulse and Reaction turbine. Pelton Wheel, Francis Turbine, Performance characteristics of Hydraulic turbines, Draft tube-types, specific speed,	

Surge Tanks, Cavitation. Specific speed, Similarity laws.	
UNIT -3	10 HRS
Centrifugal Pumps: Classification of pumps, its components and Advantages. Priming of pump, minimum starting speed-Multistage pumps-Pumps in series and parallel Performance characteristics, Losses and efficiency, Operational Difficulties, NPSH, Cavitation. **Reciprocating Pumps:** Components and Classification, working of single and double acting pumps, effect of acceleration and friction of liquids in suction and delivery pipes application of air vessels and their advantages. Co-efficient of Discharge and slip, Indicator diagram, Cavitation.	
UNIT -4	10 HRS
Hydraulic Machines: Working of Hydraulic Crane, Air Lift Pump, Hydraulic Ram, Hydraulic Lift, Jet pump, Hydraulic jack. **Hydropower:** Concepts &Applications, Safety measures in hydropower plants-Comparison of hydropower station with thermal power plants-Hydropower development in India.	
Note: Tutorials shall comprise of solving at least 5 numerical examples on the course contents & presentations on practical applications of course concept. Also visiting any one of hydropower plant, pumping station, open channel irrigation systems and preparing report is preferred.	

TEXT BOOKS:	
1	Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
2	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3	Open channel Flow, K. Subramanya, Tata McGraw Hill.
4	Open Channel Hydraulics, VenTe Chow, Tata McGraw Hill.
REFERENCE BOOKS:	
1	R. K. Rajput; Fluid Mechanics and Hydraulic Machines; S. Chand Publication.
2	S Ramamrutham; Fluid Mechanics and Hydraulic Machines; DhanpatRai Publication.
3	John Douglas, JanuszGasiorek, John Swaffield; Fluid Mechanics; Pearson Education.
4	Fluid Mechanics and Hydraulic Schaum Outline Series
5	R.K.Bansal;Fluid Mechanics and Hydraulic Machines;Laxmi Publications

STRUCTURAL ANALYSIS					
Course Code	CV430		Credits	4	
Scheme of Instruction	L	T	P	TOTAL	
Hours/ Week	3	1	0	42 hrs/sem	
Scheme of Examination	IA	TW	TM	P	O
TOTAL = 175 marks	25	25	100	0	25

Course Objectives:
The objective of the course is to provide knowledge of :
1. Principles of elastic structural analysis and behavior of indeterminate structures.
2. Methods for analyzing the indeterminate structures to evaluate the response of structures
3. Latest computational techniques and software used for structural analysis.

Course Outcomes:

The student will be able to:

CO1	Understand the behaviour of load transfer system of various structural elements and forms
CO2	Determine response of structures by classical, iterative methods, matrix methods manually and using software
CO3	Evaluate the response of indeterminate structures to various types of loadings.
CO4	Propose suitable frame systems for civil engineering structures

UNIT -1	12 HRS
Structural Elements: Forms of structures, conditions of stability, structural determinacy. Analysis of truss systems. **Analysis of Indeterminate Beams:** SFD and BMD for fixed beams; Effect of sinking of supports. Application of Moment Area method for fixed beams. SFD, BMD and Deflection diagrams for continuous beams. **Force Methods:** Strain energy, Castigliano's theorem, reciprocal deflection, deflection of beams using strain energy method and deflection of trusses using unit load method.	
UNIT -2	12 HRS
Displacement Methods: Moment Distribution Method Application for continuous beams and multi storey frames, including sway analysis.	
UNIT -3	12 HRS
Displacement Methods: Slope-Deflection; Kani's Method Application for continuous beams and frames (excluding sway.)	

UNIT -4	12 HRS
Influence Lines & Rolling loads: concept of influence lines and rolling loads, influence lines for reaction, shear force and bending moment in simply supported beams. Cables & suspension bridges-With Stiffening Girder **Three hinged Arches**. Radial shear and normal thrust in arches. Introduction to Matrix methods of analysis. Stiffness and Flexibility matrices.	
Note: Tutorials shall comprise of solving numerical examples on the course contents & presentations on practical applications of course concept and assessment (manually and using software). Term work shall consist of solving any five assignments based on course content, and studying basics of structural analysis software like STAADPRO, ETAB .etc and report.	

TEXT BOOKS:	
1	S. S. Bhavikatti; Structural Analysis Volume-I and Volume II; Vikas Publications.
2	Vazrani and Ratwani; Analysis of Structures; Khanna Publications.
3	C. S. Reddy; Basic Structural Analysis; Tata McGraw Hill.
4	C. K. Wang; Indeterminate Structural Analysis; McGraw Hill Book Company.
REFERENCE BOOKS:	
1	R. C. Hibbeler; Structural Analysis; Pearson Education Asia publication.
2	L. S. Negi and R. S. Jangid; Structural Analysis; Tata McGraw Hill.
3	Pandit and Gupta; Structural Analysis; Tata McGraw Hill, Pub. Co.Ltd .
4	Hibbeler; Structural analysis; Prentice Hall International.
5	J.S. Kinney; Indeterminate Structural Analysis; Oxford & IBH.
6	Devdas Menon; Structural Analysis; Narosa Publishing House,

TRANSPORTATION ENGINEERING					
Course Code	**CV440**		**Credits**	**4**	
Scheme of Instruction Hours/ Week	**L**	**T**	**P**	**TOTAL**	
	3	**1**	**0**	**42 Hrs/Sem**	
Scheme of Examination TOTAL = 125marks	**IA**	**TW**	**TM**	**P**	**O**
	25	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Principles and practice of transportation engineering.
2. Highway cross section elements, alignment and intersections.
3. Geometric design for various transportation facilities.
4. Various characteristics, testing methods, and standard specification of different highway materials considering the serviceability requirements of pavements.

Course Outcomes:

The student will be able to:

CO1	Learn various aspects of planning, construction and maintenance of transportation systems
CO2	Carry out traffic studies and implement traffic regulation and control measures
CO3	Characterize pavement materials
CO4	Design flexible and rigid pavements as per IRC with the knowledge of modern trends in pavements construction

UNIT -1	**11 Hrs**
Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation. **Geometric design of highways**-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems **Traffic engineering & control**- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems.	
UNIT -2	**11 Hrs**
Pavement materials- Materials used in Highway Construction- desirable properties, tests, requirements for different types of pavements. Problems **Interlocking Concrete Block Pavement :** Scope and applications- types, composition and geometry of blocks; Application in footpaths and Roads **Design of pavements**- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC	

UNIT -3	10 Hrs
Airport Engineering : Airport Planning and design - Layout of an airport with component parts and functions, Site selection for airport, Airport classification, Runway orientation using wind rose with examples, Basic runway length-Corrections and examples, Runway geometrics and design, Runway safety . **Harbours :**Classification of harbours, components- quays, jetties, landing piers, fenders, dolphins, slipways,, site selection, breakwaters, navigational aids such as light house, buoys, beacons, objectives of dredging, dredging equipments	
UNIT -4	**10 Hrs**
Railway Engineering: Typical cross sections for single and double line tracks, Gauges, Rails Functions. Sleepers –functions and types, Ballast, Geometrical design of railway track-horizontal curves - super elevation- Points and crossings-Track junctions and simple track layouts - different types of gradients-grade compensation. Signalling and Interlocking **Tunnelling:** Tunnel alignment & grade-size & shape of tunnel-methods of tunnelling in different types of rocks and soil ,ventilation, lining, drainage and lighting of tunnels, Indian scenario on TBM, shotcreting –NATM	
Note: Tutorials shall comprise of solving numerical examples on the course contents & presentations on practical applications of course concept. Visiting any two of the following and preparing report 1. Railway station 2. Tunnel, 3.Airport, 4. Harbour 5. Highway or Rural Road construction site. 2. Also study on use of IOT and Sensor and robotics technology for traffic data collection, managements and control and preparing report.	

TEXT BOOKS:	
1	Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers
2	Highway Engineering - L R Kadiyali, Khanna Publishers, New Delhi
3	Transportation Engineering – James H Banks, Mc. Graw. Hill Pub. New Delhi
REFERENCE BOOKS:	
1	IRC SP: 63-2004 "Guidelines for Use of Interlocking Concrete Block Pavement",
2	Indian Roads Congress
3	Railway Engineering –Satish Chandra ,M.M. Agarwal, Oxford University Press, New Delhi
4	Docks and Harbour Engineering –H P Oza and G H OzaCharaotar Publishing House Harbour, Dock and Tunnel Engineering – R Srinivasan, Charotar Publishing House

GEOTECHNICAL ENGINEERING					
Course Code	**CV450**		**Credits**	**3**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**0**	**0**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Engineering Behaviour of soil
2) Elastic and plastic behaviour of soil in field and laboratory applications,
3) Principles of Geotechnical design of footings and piles as foundations,
4) Stability analysis of slopes.

Course Outcomes:

The student will be able to:

CO1	Learn fundamental concepts of engineering behavior of soil.
CO2	Apply elastic and plastic concepts in understanding the equilibrium of soil mass
CO3	Analyze and Assess the stability of soil mass
CO4	Design basic dimensions of isolated footings and piled foundations

UNIT -1	
Origin of Soil and its Properties: Origin of soil, Soil as three phase system, Index properties; Plasticity characteristics of soil, Consistency, limits. Classification of soils. **Soil Exploration and Sampling:** General planning, Site exploration, Methods of site exploration. **Shear Strength:** Concept of shear strength, Mohr-Coulomb theory, Total stress and effective stress, liquefaction/ quicksand condition. **Stress Distribution:** Boussinesq Equation, Stress distribution due to concentrated load, Pressure distribution, Boussinesq stress distribution due line load, Strip load, Uniformly loaded circular area and Rectangular area, Newmark's influence chart, Westergaard's analysis.	10 Hrs
UNIT -2	
Permeability of Soil: Darcy's law, Coefficient of permeability, Permeability of stratified soils, Factors affecting permeability of soil, Seepage analysis, Stream and Potential functions, Characteristics of flow nets. **Consolidation:** Theory of Consolidation. Consolidation settlement. Sand drains and Pre-fabricated vertical drains. **Compaction:** Theory of compaction, Compaction test. Compaction in field, Compaction specifications and field control.	10 Hrs

UNIT -3	
Earth Pressure: Concept of earth pressure, Relation of deformation and earth pressure, active, passive and at rest conditions, Critical depth of open cut in cohesive soil. Soil nailing, Gabions and Reinforced earth. **Stability of Slopes:** Limit Equilibrium method, types of slope failures, Analysis of finite and Infinite slopes, Method of slices for c-Φ soil. **Bearing Capacity:** Definition, Modes of shear failure, Terzaghi's bearing capacity equation for shallow foundation, IS Code method of determination of bearing capacity, Factors influencing bearing capacity, Meyerhof's bearing capacity theory, Use of plate load test, Pressure-meter test and SPT and CPT in assessing safe bearing capacity. Calculation of bearing capacity using bore log data - a case study.	10 Hrs
UNIT -4	
Settlement Analysis: Definition, Types of settlements, Computations based on theory and test results, Effect of width and Depth of foundation, Construction time settlement, Components of settlements and their estimation, Allowable settlement values, Effects, Causes and Remedial measures of total and Differential settlements, Permissible settlements as per I.S. **Shallow Foundation:** Basic requirements, Types of foundations, Minimum depth of foundation, Contact pressure distribution, Isolated square and Rectangular footing, Combined rectangular, Trapezoidal and Strap footing and Raft foundation. **Pile Foundation:** Classification and uses, Load carrying capacity calculations of single pile by different methods, Pile load tests, Initial and Routine test, Negative skin friction, Under-reamed pile foundations; Pile groups, Efficiency, Group capacity and Settlements.	12 Hrs

TEXT BOOKS:	
1	B. C. Punmia; Soil Mechanics Foundations; Laxmi publications, Pvt. Ltd
2	Alam Singh; Modern Geotechnical Engineering; CBS Publishers and distributors
3	S. P. Brahma; Foundation Engineering; Tata McGraw Hill
4	Swami Saran; Design of Sub-Structures; CRC press
REFERENCE BOOKS:	
1	Bowles J. E.; Foundation Analysis and Design; McGraw Hill Pub. Co., New York
2	Craig R. F.; Soil Mechanics; Chapman and Hall
3	Purshottam and Raj; Soil Mechanics and Foundation; Pearson Education
4	Braja M. Das; Shallow Foundations; CRC press
5	IS Codes: IS 1904, IS 6403, IS 8009, IS 2950: Part I, IS 9214, IS 4968: Part III, IS 1080, IS 2131, IS 1888 and IS 2911: Part I to IV.

SURVEYING &GEOMATICS - LAB					
Course Code	**CV460**		**Credits**	**1**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**0**	**0**	**2**	**28 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 75 marks	**0**	**25**	**0**	**50**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. To apply the concepts of triangulation and trigonometric levelling in field.
2. To get acquainted with advanced surveying techniques and instruments such as use of Total Station, GPS, etc. in surveying

Course Outcomes:

The student will be able to:

CO1	Apply the measurement techniques and equipment used in surveying.
CO2	Effectively use modern survey equipment and techniques to measure angles and distances.

List of Experiments (Minimum 7 Experiments + 1 Project)

1. Determination of gradient using tacheometer
2. Determination of gradient using total station
3. Traversing using plane table/prismatic compass
4. Profile levelling and cross sectioning using dumpy level/auto level
5. Determination of area & length using GPS
6. Setting out of foundation / building
7. Setting out of simple curve using linear method
8. Setting out of simple curve angular method

<u>Contouring Project</u> (Any one)

9. Contouring- Grid Method

Contouring- Radial Method (Tacheometric survey)

Note: Term work shall include preparing Lab report on the experiments conducted.

REFERENCE BOOKS:	
1	Surveying &Levelling, N NBasak, McGraw Hill Publications
2	Surveying, Vol I & II, B C Punmia, A K Jain, A K Jain, Laxmi Publications (P) Ltd

FLUID MECHANICS & HYDRAULICS LAB					
Course Code	**CV 470**		**Credits**	**1**	
Scheme of Instruction Hours/ Week	**L**	**T**	**P**	**TOTAL**	
	00	**00**	**02**	**28 Hrs/Sem**	
Scheme of Examination TOTAL = 75 marks	**IA**	**TW**	**TM**	**P**	**O**
	00	**25**	**00**	**50**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Fluid properties and pressure measuring devices
2. Applications of various hydraulic engineering problems like open channel flows and hydraulic machines.

Course Outcomes:

The student will be able to:

CO1	Verify principles of fluid statics, kinematics and dynamics experimentally.
CO2	To determine performance characteristics of hydraulic devices & machines.
CO3	To derive conclusion and comments on results of experiments

Experiments (At least 8 experiments should be conducted from the list of experiments
1. To determine the metacentric height of a given ship model 2.Verification of Bernoullis theorem 3. To determine coefficient of discharge of an orifice and mouthpiece 4.Calibration of a Venturimeter /Rotameter 5.To determine the coefficient of discharge of a notch/weir 6.To determine the coefficient of discharge of an Orifice meter 7. To determine head loss due to bend and nozzle 8. To determine coefficient of friction, major and minor losses in pipes 9. Demonstration of Reynolds's experiment 10. To determine Chezy's and Manning's constant for the given channel section 11. To determine the coefficient of discharge for a venturiflume 12. To determine the characteristics of a hydraulic jump 13. To determine the performance and plot characteristic curves for a Pelton

wheel 14. To determine the performance and plot characteristic curves for a centrifugal pump 15. To study performance and plot characteristic curves of a reciprocating pump

Note: Term work shall include preparing Lab report on the experiments conducted.

REFERENCE BOOKS:	
1	Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
2	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3	Open channel Flow, K. Subramanya, Tata McGraw Hill.
4	Open Channel Hydraulics, VenTe Chow, Tata McGraw Hill.
5	R. K. Rajput; Fluid Mechanics and Hydraulic Machines; S. Chand Publication.

ECONOMICS FOR ENGINEERS					
Course Code	**HM003**		**Credits**	**3**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**0**	**0**	**39 Hrs/Sem**	
Scheme of	**IA**	**TW**	**TM**	**P**	**O**
Examination TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

1. To expose students to basic Economic concepts and apply economic reasoning to problems of business.
2. To familiarize the students with the microeconomics principles of economics.
3. To enhance students understanding of macroeconomic issues and problems.
4. To acquaint the students with standard concepts that they are likely to find useful in their profession when employed.

Course Outcomes:
After the successful completion of the course, the student will be able to:

CO1	To acquire the skills to apply the basics of economics to Engineering
CO2	To evaluate the economic theories, cost concepts and pricing policies
CO3	To calculate National Income, Inflation and Price Index
CO4	To evaluate the different measures of Economic Growth & Development.

UNIT 1	
Central concepts of Economics- Definitions of Economics, Scarcity and Efficiency, Nature of Economics: Positive and normative economics, Microeconomics and Macroeconomics Basic Elements of Supply and Demand- The Demand Schedule, The Demand Curve, Market Demand , Forces behind the Demand Curve, Shifts in Demand. The Supply Schedule The Supply Curve, Forces behind the Supply Curve , Shifts in Supply. Equilibrium of Supply and Demand, Effect of a Shift in Supply or Demand. Supply and Demand: Elasticity and Applications to major economic issues **Estimation/Forecasting of Demand:** Meaning, importance, methods – trend, exponential smoothing, regression analysis	**10 Hours**

UNIT 2	
Microeconomics: Demand & Consumer Behaviour- Choice & Utility Theory. Production and Business Organization, Theory of Production and Marginal Products Basic Concepts, The Nature of the Firm, Big, Small, and Infinitesimal Businesses. Economic Analysis of Costs, Total Cost: Fixed and Variable. Production, Cost Theory, and Decisions of the Firm. Market structures.Perfect and imperfect competition, oligopoly, monopoly.	**10 Hours**
UNIT 3	
Macroeconomics: Key Concepts of Macroeconomics. Objectives and Instruments of Macroeconomics. Aggregate Supply and Demand. **National Income Terms:** -Gross Domestic Product: The Yardstick of an Economy's Performance. Real vs. Nominal GDP. Net Domestic Product, GNP, National Income, Per capita income, Disposable Income, Price Index, Inflation. Consumption and Investment- Consumption, Income, and Saving, Investment. Determinants of Investment. Monetary Policy and the Economy .Government Control of the Economy- The Tools of Government Policy	**10 Hours**
UNIT 4	
Economic Growth and Development: Economic Growth- The Long-Term Significance of Growth, The Four Wheels of Growth. Economic Development- meaning, criteria, measures of development- Per Capita Income, Index of Human Development . Financial markets- Structure, Participants, functions. Capital market- Instruments, Players, trading - Primary and secondary market - Role of stock exchanges and stock indices. Money market	**09Hours**

TEXT BOOKS:	
1	P.A. Samuelson & W.D. Nordhaus, Economics, 19th Edition McGraw Hill, New York, 1995.
2	A. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975.
3	O.P. Khanna , Economics for Engineers,VK Global Publications Private Limited.
REFERENCES	
1	Chandra P., Fundamentals of Financial Management, Tata McGraw Hill Education Private Limited, New Delhi

FLUID MECHANICS					
Course Code	**CV320**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 150 marks	**25**	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of:

1. Fluid properties and pressure measuring devices
2. Fluid statics and dynamics
3. Pipe flows and pipe networks for calculating discharges and losses in various pipes and fittings.
4. Dimensional and model analysis.

Course Outcomes:

The student will be able to:

CO1	Understand the basic concept of fluid flow and properties of fluids.
CO2	Analyze fluid flow problems with the application of momentum and energy equations
CO3	Design pipe networks
CO4	Perform dimensional analysis for problems in fluid mechanics.

UNIT1	
Properties of fluids –Density, Specific weight, Specific Gravity, Kinematic and Dynamic Viscosity, Variation of viscosity with temperature, Newton law of viscosity, Distinction between Real and Ideal fluid- vapour pressure -cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics**- Fluid Pressure: Pressure at a point, Pascals law, Pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, pressure gauges.	10 Hrs
UNIT 2	
Hydrostatic pressure and force: horizontal, vertical, inclined and curved surfaces. Buoyancy and stability of floating bodies. **Fluid Kinematics**- Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two- and three -dimensional continuity equations in Cartesian coordinates.	10 Hrs
UNIT 3	
Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation - derivation; Energy Principle; Practical applications of Bernoulli's Equation: Venturimeter, Orifice meter and pitot tube; Flow through rectangular	12 Hrs

and triangular notches, Momentum principle; Forces exerted by fluid flow on pipe bend. **Flow through Pipes**- Loss of head through pipes, Darcy-Weisbach equation, minor losses, total energy equation, Hydraulic gradient line, Pipes in series and parallel, equivalent pipes, siphon, power transmission through pipes , branching of pipes **Analysis of pipe networks**- Hardy Cross method, water hammer in pipes and control measures	
UNIT 4	
Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem **Laminar flow** through circular pipes-Hagen Poiseuille Law, and Flow through parallel plates, **Turbulent Flow**- Reynolds experiment, Prandtl's universal velocity distribution equation. Turbulent flow through smooth and rough pipes.	10 Hrs
Note: Tutorials shall comprise of solving numerical examples on the course contents & presentations on practical applications of course concept and assessment. Term work shall include at least five assignments based on above syllabus and any one of the following. 1. Preparing report on principles of fluid mechanics used in industrial process in the factory/industry located in the local area 2. Visiting water supply and pipe network located in the local area and preparing report	

TEXT BOOKS:	
1	Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.
2	Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3	Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
REFERENCE BOOKS:	
4	Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.
5	Fluid Mechanics and Hydraulic Machines , R. K. Rajput , S. Chand & Company

ENGINEERING GEOLOGY					
Course Code	**CV330**		**Credits**	**3**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**0**	**0**	**42 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 125 marks	**25**	**0**	**100**	**0**	**0**

Course Objectives:

1. To study and identify different types natural materials like rocks & minerals and soil.
2. To understand the various natural dynamic processes their influence on the surfacial features, natural material and their consequences.
3. To know the physical properties of rocks & minerals.
4. To know the importance of geological maps and language helpful for Civil Engineering projects

Course Outcomes:

CO1	To understand the processes of the agents in modifying the earth's surface, origin of landforms of the earth's crust and origin of various rock types
CO2	To identify, classify the various rocks and types of structures in rocks in hand specimen and classify them.
CO3	To Analyze the minerals based on their physical properties
CO4	To evaluate suitability of rocks and various minerals for Civil Engineering Projects

UNIT1	**10 Hrs**
Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Departments dealing with this subject in India and their scope of work- GSI, NIRM. Mineralogy-Mineral, Origin and composition,Mineral Groups. Physical properties of minerals. Petrology-Rock forming processes. Igneous petrology-Formation of igneous rocks, Textures, structures, composition, general classification.Study of Felsic Igneous rocks like Granite, Rhyolite or Tuff, Pegmatite.Mafic Igneous rocks Like Gabbro, Dolerite, Basalt. Engineering aspect to granite and basalts. **Sedimentary petrology**- mode of formation, Mineralogical Composition. Textures, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks. Study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone. Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, structures & textures in metamorphic rocks. Detailed study of Gneiss, Schist, Slate with engineering consideration.	
UNIT 2	**10Hrs**
Physical Geology- Processes of Weathering and its products. Erosion and Denudation. Engineering consideration. Superficial deposits and their geotechnical importance: Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landforms, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits. Ground water: Factors controlling water bearing capacity of rock: porosity, specific yield. Specific retention, permeability, hydraulic conductivity. Pervious & impervious rocks and ground water. Aquifer types. Lowering of water table and cone of exhaustion. Related Subsidence.	
UNIT 3	**10Hrs**

Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Types of Unconformities. Importance of structural elements in engineering operations. Fold- nomenclature. Types of folds, recognition in field. Faults: Classification based on type of slip, classification based on relative movement of Hanging wall and Foot wall, classification based on mode of occurrence, Classification based on type of displacement along fault plane, recognition of faults in field, effects on outcrops. Joints: Types, Stresses responsible, geotechnical importance. Core logging. Rock Quality Designation. Rock mass description.	
UNIT 4	**12 Hrs**
Geological Hazards-Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Types of landslide. Effects of landslides, Methods of slope control and stabilisation. **Earthquake**: Magnitude and intensity of earthquake. Seismic Zones of India. Seismic sea waves. Revelation from Seismic Records of internal structure of earth. **Geology of dam and reservoir site**- Geological considerations for selecting dam and reservoir site. Failure of Reservoir. Favourable & unfavourable conditions in different types of rocks in presence of various structural features, precautions to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment of such structures.	

Tutorials :

1. Megascopic Identification and Description of rock forming minerals: Olivine, Pyroxene, Amphibole group, Mica group, Silica group, Feldspar group.
2. Megascopic identification and Description of Ore minerals and Calcite, Dolomite, Baryte, Gypsum, Corundum, Tourmaline, Kyanite, Garnet.
3. Megascopic Identification and Description including the industrial application of Igneous Rocks.
4. Megascopic Identification and Description including the industrial application of Sedimentary Rocks
5. Megascopic Identification and Description including the industrial application of Metamorphic Rocks
6. Understanding toposheets.
7. Exercises on geological maps and drawing sections for horizontal series of beds intruded by dykes.
8. Exercises on geological maps and drawing sections for inclined series of beds.

TEXT BOOKS:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria& Sons.
2. Text Book of Engineering Geology, N. ChennaKesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Engineering Geology, F. G. Bell, 2nd Edition (2007), Elsevier
3. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

BUILDING MATERIALS AND CONSTRUCTION					
Course Code	**CV340**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**3**	**1**	**0**	**42 Hrs/ Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 150 marks	**25**	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Different components that form a building.
2. Selection of building materials.
3. Designing standard components of a building such as masonry, flooring, roofing, plastering and painting, wall openings, and staircase.
4. Recommending newer alternatives for major building components.

Course Outcomes:

The student will be able to:

CO1	Understand the various types of building materials and construction techniques
CO2	Select building materials to suit the various requirements
CO3	Design staircases of various configurations
CO4	Recommend newer materials for use in buildings.

UNIT1	
Origin, Characteristics, Properties and uses of Building Materials of: Building Stones, Bricks and other clay products, Lime, Cements, M-Sand, Aggregates, Concrete (plain, reinforced and steel- fibre/ glass-fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete, Smart Concrete and Special concretes), chemical admixtures, Structural Steel and other Metals and alloys. Water proofing chemicals.	10**Hrs**
UNIT 2	
Origin, characteristics, properties and uses of building materials of: Ceramics, and Refractories, Bitumen and asphaltic materials, Glass and Plastics, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, Timbers, laminates and adhesives, Carbon composites, Industrial wastes used in building construction, Plumbing fixtures and fittings.	10**Hrs**
UNIT 3	
Introduction to a Building Structure and Foundations: Components of a typical structure. Sequence of construction. **Masonry:** Brick and stone masonry, Load bearing, cavity and partition walls. Mortar and types of mortars, Introduction to Lintel and arches, stages of masonry construction. Construction Joints **Floors and Roofs:** Floors - Introduction, essential requirements of a floor, factors affecting selection of flooring material, types of floors, Roofs - requirements of good roof technical terms, classification, types of roof coverings for flat and pitched roof. **Doors and Windows:** Doors - Location, technical terms, size, types, construction, suitability and varieties of materials for doors and Windows - Factors affecting selection of size, shape, location and no. of windows, types, construction,	11 **Hrs**

suitability, fixtures and fastenings Frames for exhaust fans, Air-conditioners and forced ventilation units etc.	
UNIT 4	11**Hrs**
Formwork and Scaffolding: Formwork, Materials, Construction, Methods of removal, Period of removal, Principles of Design of Formwork .Scaffolding, Definition, Component parts, Types of scaffolds. **Stairs and Elevators:** Types and materials for staircase, Layout and design details of Dog legged staircase, Elevators, Types - Traction - Hydraulic operation - Design considerations of passenger elevators - Handling capacity , Arrangement of lifts. Escalators, Ramps: features, operation & arrangement. **Plastering, Pointing and Painting:** Plastering: Purpose, Materials, Methods of plastering, Surface preparation, Defects in plastering, Pointing –Preparation of surface for pointing, Types, Defects, Rectification. Introduction to Paintings and types of Painting, Constituents of paints & types, Purpose of Painting, Defects in Painting, Application of Paints to new and old surfaces. **Pre-cast and pre-fab Construction**- Precast and prefab components and fabrication, total and partial prefabrication, 3D printing. **Plumbing** - Essential requirements of plumbing systems. **Termite Proofing, Sound Insulation, Thermal Insulation**- Basic principles.	
Note: Tutorials and Term work shall include at least five assignments based on above syllabus and any three of the following exercise 1. At least two site visit of different construction type and preparing site visit report. 2. Student to organize a truss making exercise using any locally available materials including bamboos and locally available wood and metal and prepare technical report on trusses. 3. Students to make arches, domes using locally available bricks and stones and prepare report on materials used and technique adopted to obtain stability. 4. Study and Report on locally available building materials. 5. Study and Report on different types of constructions and building safety being practiced in local area. 6. Study on application of IOT in material testing, quality and building safety.	

TEXT BOOKS

1	Sushil Kumar; Building Construction; Standard Publication.
2	Rangawala S. C.; Building Construction; Charotar Publishing House Pvt. Ltd.
3	S.K Sharma; Building Construction; S. Chand & Co. Ltd.
4	Kumar Neeraj Jha; Formwork for Concrete Structures; Tata Mcgraw Hill Publishing Co Ltd.
REFERENCE BOOKS:	
1	Varghese P.C.; Building Materials; PHI Learning Pvt. Ltd.,
2	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
3	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement

COMPUTER-AIDED CIVIL ENGINEERING DRAWING					
Course Code	**CV350**		**Credits**	**4**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**2**	**1**	**2**	**28 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 150 marks	**25**	**25**	**100**	**0**	**0**

Course Objectives:

The objective of the course is to provide knowledge of:

a) Development of plan, elevation, section and the conventions of formal engineering drawing

b) Communication of a design idea/concept graphically/ visually

c) Interpreting 2D & 3D drawings

d) Producing designs using a combination of 2D and 3D software.

Course Outcomes:

The student will be able to:

CO1	Learn fundamental concepts of building drawing.
CO2	Apply concepts to communicate a design idea/ concept.
CO3	Analyse and Interpret given 2D & 3D drawings
CO4	Plan a building as per building byelaws and producedrawings.

UNIT1	
1. INTRODUCTION: Introduction to concept of drawings, Interpretation of typicaldrawings, layout of drawings and Scales; Principles of planning FAR, Coverage. Building Bye laws. Symbols and sign conventions. **Introduction to computer aided drawing**: co-ordinate systemsand reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks.	08 Hrs
UNIT 2	
2. BUILDING DRAWING: Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation and roof plan. Interior design and detailing of major building components: Modular kitchen, False ceilings , air conditioning etc.	08 Hrs
UNIT 3	
3. PUBLIC BUILDING: General, Necessary and minimum requirements of public accommodations. Zoning and Design aspects. Design of Buildings for Education, Commercial and Health	06Hrs
UNIT 4	
4. PICTORIAL VIEW: Principles of perspective drawing. Rules corresponding to perspective drawing.Perspective view of building.	06Hrs
TUTORIALS and Term work: 1. Buildings with load bearing walls including details of doors and windows. 2. Taking standard drawings of a typical two storied building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words.	

3. RCC framed structures 4. Reinforcement drawings for typical slabs, beams, columns and spread footings. 5. Industrial buildings - North light roof structures - Trusses 6. Perspective view of one and two storey buildings	

***Note**: Term work shall consist of at least 3 drawing assignment on AUTOCAD. The Computer Aided Drafting instructions and examination is preferred.*

TEXT BOOKS:	
1	M.G. Shah , C. M. Kale and S.Y. Patki; Building Drawing;Tata McGraw Hill Publication
2	George Omura ; Mastering Auto CAD 2014;Wiley Publication.
3	Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- McGraw-Hill Company Limited, New Delhi.
4	Sham Tickoo and Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education.
REFERENCE BOOKS:	
1	Subhash C Sharma &Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers.
2	Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing KDR building, Calicut.
3	S. S. Bhavikatti and M. V. Chitawadagi ; Building Planning and Drawing; I K International Publishing House.
4	Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., New Delhi.

MECHANICS OF SOLIDS - LAB					
Course Code	**CV360**		**Credits**	**1**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**0**	**0**	**2**	**28 hrs/sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 50 marks	**0**	**0**	**0**	**50**	**0**

Course Objectives:

The objective of the course is to provide knowledge of :

1. Need to test steel that is used as reinforcement in concrete
2. Properties that are determined in the laboratory test.
3. Various tests that are conducted on steel
4. Interpretation of the test results.

Course Outcomes:

The student will be able to:

CO1	Learn the various testing procedures for different building materials
CO2	Understand which parameters are to be tested
CO3	Interpret the results of the tests
CO4	Classify the material based on test results.

PRACTICALS	
At least 8 experiments should be conducted from the list of experiments 1. Tension test 2. Bending tests on simply supported beam and Cantilever beam. 3. Compression test on concrete 4. Impact test 5. Shear test 6. Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation, 7. Determination of torsion and deflection, 8. Measurement of forces on supports in statically determinate beam, 9. Determination of shear forces in beams, 10. Determination of bending moments in beams, 11. Measurement of deflections in statically determinate beam, 12. Measurement of strain in a bar 13. Bend test steel bar; 14. Yield/tensile strength of steel bar;	

REFERENCE BOOKS:	
1	R. C Hibbeler; Mechanicsof Materials; Pearson Education
2	S. S. Bhavikatti; Strength of Materials; Vikas Publishing House
3	S. Ramamurtham; Strength of Materials; DhanpatRai Publishing company
4	F. Beer and E. Johnson; Mechanics of Materials; McGrawHill
5	L. S. Negi; Strength of materials; Tata McGraw Hill, New Delhi

MATERIAL TESTING LAB					
Course Code	**CV370**		**Credits**	**1**	
Scheme of Instruction	**L**	**T**	**P**	**TOTAL**	
Hours/ Week	**0**	**0**	**2**	**28 Hrs/Sem**	
Scheme of Examination	**IA**	**TW**	**TM**	**P**	**O**
TOTAL = 50 marks	**0**	**0**	**0**	**50**	**0**

Course Objectives:

The objective of the course is to provide knowledge of:

1. Need to test building materials
2. Properties that are determined in the laboratory
3. Various tests that are conducted on building materials
4. Interpretation of the test results.

Course Outcomes:

The student will be able to:

CO1	Learn the various testing procedures for different building materials
CO2	Understand which parameters are to be tested
CO3	Interpret the results of the tests
CO4	Recommend the type of tests that should be carried out for any building material.

PRACTICALS

A minimum of 8 experiments from the list shall be conducted

Gradation of coarse and fine aggregates

1. Tensile Strength of materials & concrete composites
2. Dimension test on clay burnt bricks and fly ash bricks, laterite stone, Concrete Blocks
3. Water absorption test on clay burnt bricks and fly ash bricks, laterite stone, precast concrete blocks, paver block
4. Efflorescence test on clay burnt bricks and fly ash bricks
5. Compressive strength on laterite/Brick/Concrete /Paver / Timber
6. Density test on precast concrete blocks, Paver and timber block
7. Moisture content of timber block, Bricks, Laterite
8. Specific gravity of coarse and fine aggregates
9. Flexure test on tiles
10. Impact Test on tiles
11. Pressure test on pipes

REFERENCE BOOKS:

1	M.L. Gambhir, NehaJamwal, Building and Construction Materials: Testing and Quality Control (Lab Manual Series) (2017), McGrawHill (India)Pvt. Ltd.
2	Kishore K,RavichawlaCbKukreja, Material Testing Laboratory Manual For Quality Control (20160, Standard Publishers distributors.
3	Varghese P.C.; Building Materials; PHI Learning Pvt. Ltd.,
4	Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
5	KyriakosKomvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
6	Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications

TECHNICAL COMMUNICATION

Course Code	HM001		Credits	2	
Scheme of Instruction	L	T	P	TOTAL	
Hours/ Week	2	0	0	2	
Scheme of Examination	IA	TW	TM	P	O
TOTAL = 75 marks	0	75	0	0	0

Course Outcomes:

The student will be able to:

CO1	Demonstrate precise language skills with suitable vocabulary and apt style.
CO2	Develop life skills/interpersonal skills to progress professionally.
CO3	Apply traits of suitable candidature for a job/higher education.
CO4	Deliver formal presentations and effectively implementing the verbal and non-verbal skills.

UNIT -1	7
Communication **Oral Communication** Listening, Speaking, Reading, Writing (LSRW), Conversational Dialogues, Role Play, Barriers to Oral Communication, Effective Oral Communication, Principles of Communication, Dos and Don’ts of Group Discussion **Global Communication** Social Media, People Analytics, Models of Culture, Cross-Cultural Communication, Compare Cultures of the World, Impact of Cultural Differences on Managerial Communication, Effective Communicator in a Cross-Cultural setting	
UNIT -2	7
Personality Development Social Etiquette, Email Etiquette, Table Etiquette, Telephone Etiquette, SWOC Analysis, Life Coaching, Emotional Intelligence, Leadership, Time Management, Motivation, Goal Setting, Team Work and Collaboration, Critical Thinking and Problem Solving, Professional Attitude, Persuasion, Anxiety and Stress Management, Social Responsibility	
UNIT -3	6
Career Development Resume Building, Interviewing Skills, Job Search, Personal Networking and Branding, Personal Finance, Build Professional Portfolio	
UNIT -4	6
Public Speaking Methods to overcome anxiety, Build Confidence, Use of Media Aids, Craft an Impactful Speech, Design Impactful Presentations, Effective Presentation Delivery	

TEXTBOOKS	
1	Meenakshi Raman and Sangeeta Sharma; Technical Communication: Principles and Practice, 3rd ed; Oxford University Press
2	Meenakshi Raman, Prakash Singh; Business Communication; 2nd ed.; Oxford University Press
3	Dr. K. Alex; Soft Skills: Know Yourself and Know The World; 3rd ed; S. Chand Publishing
REFERENCES	
1	Nicky Stanton; Mastering Communication; 5th ed.; Palgrave Master Series; Red Globe Press
2	Ghosh, B. N.; Managing Soft Skills for Personality Development; Tata McGraw Hill; 2012
3	Wallace and Masters; Personal Development for Life and Work;10th edition; Thomson Learning
4	Lehman, Dufrene, Sinha; BCOM : A South-Asian Perspective with CourseMate; 2nd edition; Cengage Learning
5	Ashraf Rizvi; Effective Technical Communication; Tata McGraw-Hill; 2005
6	MolefiKete Asante, William B. Gudykunst, Bella Mody; Handbook of International and Intercultural Communication; 2nd ed.; Sage Publications

MATHEMATICS-I& II (BRIDGE COURSE)					
Course Code	**AC390**		**Credits**	**0**	
Scheme of Instruction Hours/ Week	**L**	**T**	**P**	**TOTAL**	
	2	**0**	**0**	**28 hrs/sem**	
Scheme of Examination TOTAL = 0 marks	**IA**	**TW**	**TM**	**P**	**O**
	0	**0**	**0**	**0**	**0**

Course Outline:

This is an audit course.

This course is compulsory to direct second year/lateral entry students. It is introduced to reduce the knowledge gap in the students.

The syllabus is selected topics from FE110 Mathematics I and FE120 Mathematics II.

The Text books and References are same as shown in FE110 Mathematics I and FE120 Mathematics II.

Form A-7
(See OA-14 of Part A)
Performa for the submission of the minutes of the Board of Studies

ANNEXURE C

Form A-7
(See OA-14 of Part A)
Performa for the submission of the minutes of the Board of Studies

QUESTION PAPER PATTERN

Syllabus in each subject will have 4 units.

Question paper shall be drawn as follows:

Question No	From Units	No. of Questions to be Set	No. of Questions to be Answered	Remarks
1-3	1-2	3 x 20marks	2 x 20 marks	Each unit shall have minimum 20 marks
4-6	3-4	3 x 20 marks	2 x 20 marks	Each unit shall have minimum 20 marks
7-8	1-4	2 x 20 marks	1 x 20 marks	---
		8 - 160 marks	5 - 100 marks	

SAMPLE QUESTION PAPER

SUBJECT: MARKS: 100

MAXIMUM DURATION: 3 hours

Instructions to the candidates:

1.

2

Part –A (Questions to be drawn from units 1 & 2)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-1 .....20 Marks

a)

b)

..

Question-2 .....20 Marks

a)

b)

..

Question-3 .....20 Marks

a)

b)

..

Part –B (Questions to be drawn from units 3 & 4)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-4 .....20 Marks

a)

b)

..

Question-5 .....20 Marks

a)

b)

..

Question-6 .....20 Marks

a)

b)

..

Part –C (Questions to be drawn from all units i.e. units 1 - 4)

Answer any **ONE** question from the following: 1 x 20= 20 Marks

Question-7 .....20 Marks

a)

b)

..

Question-8 .....20 Marks

a)

b)

..

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