Branch: Civil Engineering.   **Year: Second.**   **Semester: Fourth**

Total marks: 1150   Total Periods: 35   Total Credits: 33

SL. NO.	COURSE NO.	SUBJECT	PERIOD			EVALUATION SCHEME					
			L	T	P	Sessional Examination			ESE	Subject Total	Credit
						TA	CT	Total			
		Theory									
1.	MA 411	Advanced Mathematics & Numerical Analysis.	3	1		30	20	50	100	150	4
2.	HU 402	Sociology and Accountancy.	3	1		30	20	50	100	150	4
3.	HU 403	Communication Skill.	2			15	10	25	50	75	2
4.	CE 412	Theory of Structures-II.	3	1		30	20	50	100	150	4
5.	CE 413	Advanced Surveying.	3	1		30	20	50	100	150	4
6.	CE 414	Hydraulics and Hydraulic Machines.	3	1		30	20	50	100	150	4
7.	CE 415	Engineering Geoscience.	3	1		30	20	50	100	150	4
8.	CE 416	General Proficiency.							25	25	1
		Practical/Drawing/Design									
9.	CE 413 L	Advanced Surveying.			3	30	20	50		50	2
10.	CE 414 L	Hydraulics and Hydraulic Machines.			3	30	20	50		50	2
11.	CE 415 L	Engineering Geoscience.			3	30	20	50		50	2
Total			20	6	9						

TA: Teachers assessment.   *CT: Class Test.*   *ESE: End Semester Examination.*

FOURTH SEMESTER
ADVANCED MATHEMATICS AND NUMERICAL ANALYSIS
SUB CODE: MA 411 (CE & Ch.E)

Theory – 100 marks.
Sessional – 50 marks.
Time – 3 Hours.

Linear Programming: L P Problems and their solutions by Simplex method.

25 Marks.

Unit-I: Partial differential equations:

Formation of partial differential equations, equation solvable by direct integration, linear and non-linear equations of first order, homogenous linear equation with constant coefficients solution of heat equation, wave equation and Laplace equation.

Unit-II: Calculus of Complex variables: 20 Marks.
Analytic functions, C-R equations, Conjugate functions, Harmonic functions, orthogonal systems, formation of analytic function, Conformal mapping, Integration of a Complex function, Cauchy's integral theorem, Power series representation of complex functions, Laurent's series, singularities, Residue theorem.

Unit-III: Numerical Analysis: 35 Marks.
Solution of non-linear equations (Newton-Raphson method, Bisection method, Regula-falsi method), Solution of linear algebraic equations (Gauss elimination method, Gauss-siedel method, Gauss Jordan method), Solution of ordinary differential equations (Taylor's series method, Runge Kutta method).
Interpolations and approximation: operators: Δ, E, ∂.
Gregory- Newton's forward and backward formula, Langrange's interpolation formula & Bessel's formula with remainder terms or errors, Chebyshev polynomial approximation.
Numerical Integration: Trapezoidal Rule, Simpson's Rule and Gaussian quadrature.

Unit-IV: Optimization Methods: 20 Marks.
Optimization by calculus: unconstrained function of a signal variable, unconstrained function of multiple variables, Functions with equality constraints, Functions with inequality constraints.

Text/References:

1. Complex variable & applications   : Churchil   : Mc Graw Hills.
2. Elements of P.D.Es.   : I. M. Snedon   : S. Chand & Co.

3. Numerical methods in Science and Engineering   : S. Rajasekaran   : Wheeler.
4. Numerical methods with Computer programs in C++: Pallab Ghosh   : Prentice Hall.
5. Numerical methods.   : M. K. Jain & S. R. K. Iyengar: Wiley.

<p align="center">FOURTH SEMESTER</p>

6. A Text Book on Engineering Mathematics.   : Bali, Saxena, Iyengar: Laxmi Publications.
7. Operation Research.   : Prem Kumar Gupta   : S. Chand.
8. Advanced Engineering Mathematics.   : Peter V O'Neil   : Thomson Books.
9. Analysis of Descret Physical systems.: Koenig, Y. Toked & H. K. Kesavan: Mc Graw Hill.

<p align="center">SOCIOLOGY AND ACCOUNTANCY
SUB CODE: HU 402</p>

<p align="center"><u>Part A. Sociology and Industrial Relations</u>
Theory: 50   Sessional: 25</p>

1. Concept of the state. Origin and Development of the State. The individual and the State.
2. Social Institutions and Social Groups. Non-governmental Organizations and Panchayati   Raj Institutions; local communities and alternate social Groups-characteristics, functions and purposes;
3. Social structure. Social differentiation; Role, Status, Power and Authority; Social differentiation. Social order and social problems.
4. Social Change: Meaning and nature of social change; factors effecting social change; Technology and social change; Social and economic displacement. Labour and Labour Relations; Organised and unorganized labor; Problems associated with labour. Labour problems: absenteeism, labour turnover, displacement and obsolescence.
5. Human resources: Meaning and development; Relation with industrial and economic needs. Industrial productivity. Workers participation in Management.
6. Man Power Planning: Definition and Objectives. Characteristics of Man Power Planning. Manpower Demand and Supply forecasting.
7. Industrial disputes- settlement of Industrial disputes. Trade Unionism in India. Labour legislation in India- Indian Factories Act, 1948. Payment of Wages Act, I 936.workmens Compensation Act, 1923.
8. Social Security: concept of social security. Provision for Social security in India.

Recommended readings:
1. Rao, C.N. Sankara, Sociology.
2. Sarma, RN, Principles of Sociology.
3. Mukherjee, R.K, Indian Working Class.
4. Saxena, R.N, Labour Problems and Social Welfare.

Part B. Accountancy
Theory: 50   S Sessional: 25

1. Dual aspect concept of Accounts, classification of Accounts, cardinal rules for Debit and   Credit, Journal, Ledger, Balancing of Account.
2. Subsidiary books, types of Cashbook, Imprest, Petty cash book, Bank reconciliation statement.
3. Trial balance; Trading and Manufacturing account; Profit and Loss account; balance sheet with adjustments.
4. Concepts of Capital expenditure and Revenue expenditure; Bad debt and doubtful debt, Reserve capital and Liabilities; Outstanding expenses; Prepaid expenses, Marshalling of Balance sheet, Liquidity and Profitability of assets.
5. Cost accounting- concept, benefits and distinction between cost accounting and financial accounting- various elements of cost, cost sheet, overhead cost, Job and process costing.
6. Depreciation — concept and importance. Methods of charging depreciation on fixed assets used in industries.

Recommended readings:
1. Shukla, MC., Grewal T.S., and Gupta, SC: Advanced Accounts; *S*. Chand & Co. New   Delhi.
2. Agarwala A. N. Agarwala K. N~ Higher Sciences of Accountancy: Kitab Mahal Allahabad.
3. Rajpurohit R. S., Bissa, and others: Financial Accounting.
4. Cost Accounts- M.C. Shukla.

FOURTH SEMESTER
COMMUNICATION SKILLS
SUB CODE: HU 403

Theory- 50 marks.
Sessional-25 marks.
Time: 1½ Hours.

1) Group Discussion: aspects; preparation; facing group discussions.

2) Communication: Aspects, Issues and Vitals.

3) Body Language: Studying body language; its orientation.

4) The art of listening: Active listening; hearing and listening; good listening; Barriers to listening.

5) Negotiation- The act of negotiation. Truths about negotiation; hurdles in negotiation.

RECOMMENDED BOOKS:

1. Essentials of Business Communication :   Pal and Rorualling; Sultan Chand and Sons.

2. The Essence of Effective Communication: Ludlow and Panthon; PHI.

3. A Practical English Grammar by Thomson and Marlinet.

4. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill.

5. English Conversation Practice by Grount Taylor; Tata McGraw Hill.

6. Developing Communication Skills by Krishna Mohan and Meera Banerji:
   MacMillan India Ltd., Delhi.

FOURTH SEMISTER
THEOTY OF STRACTURES-II

1. **Fixed beams:**
   Beans fixed at one end freely supported at the other, both ends fixed subjected to concentrated load, uniformly distributed load, couple and condition.

2. **Continuous Beam:**
   Three moment theorem. Continuous beams with fixed end, overhang & sinking   supports.

3. **Flexibility co-efficient of structural:**
   Force method (consistent deformation methods) applied to beams and frames.

4. **Elastic theory of arches:**
   Two hinged arch-circular and parabolic, Yielding of support, rib shortening, fixed arch-elastic center method and column analogy method;

5. **Suspension girder bridge:**
   Analysis of two hinged and three hinged stiffening girder.

6. **Approximate Analysis of frame:**
   Introduction to moment distribution for beams, Method of substitute frame, Portal and cantilever method of analysis of building frames for lateral loads.

SUB CODE: CE 413

7. **Concept of structural stability:**
   Equilibrium and energy methods for critical loads of simple struts, Introduction to buckling of portal frame.

8. **Dams and Retaining wall:**
   Different types of Dams, Stability analysis of Dam, Different types of retaining wall, Analysis for with and without surcharge.

FOURTH SEMISTER
ADVANCED SURVEYING

Theory-100 marks.
Sessional-50 marks.
Practical-50 marks.
Time- 3 Hours.

Triangulation:
Object, classification of triangulation systems, Reconnaissance-selection of stations, intervisibility and height, signals and towers, phase of signal, Base line measurement, Extension of base, Measurement of horizontal angles, satellite station-reduction to center.

Adjustment of computation:
Error and precision, Laws of accidental error, General principle of least squares, Laws of weight, Determination of probable error, Distribution of error to field measurements.
Determination of most probable values- Normal equation, method of correlates. Triangulation adjustment- station and figure adjustment, Adjustment of chain of triangles and geodetic quadrilateral.

Electronic Distance Measurement:
Electromagnetic Waves-important characteristics, Distance measurement by transit time and phase difference, Carrier waves, method of modulation, Electro- optical E.D.M. instruments, Infrared EDM instruments, Microwave EDM instruments, Target-component and characteristics. Introduction to Electronic theodolite and Total Station.

Trilateration:
Use, advantages, Triangulation Vs Trilateration, check angle, zenith angle and reduction of slope distance from vertical angle and elevations, adjustments of trilateration.

Photogrammetry:
Types of aerial photograph, components of an aerial camera, photo- coordinates measurements, scale of a vertical photograph, horizontal length and direction of a line. Flight planning. Determination of elevation-method of relief displacement. Stereoscopic observation- parallax, principle of floating point, use of stereometer and stereoscope. Stereoscopic plotting instruments. Introduction to Terrestrial photogrammetry.

Map projections:
Basis of map projection, ideal map projection, introduction to orthographic, polyconic and transverse mercator projection.

Satellite remote sensing:
Electromagnetic energy, electromagnetic spectrum, atmospheric window, active and passive remote sensing, practical remote sensing system, types of data products. Visual interpretation of hardcopy data, principle of digital classification.

FOURTH SEMISTER
ADVANCED SURVEYING (PRACTICAL)

Practical-50 marks.
Time- 3 Hours.

To carry out open traverse with theodolite for route alignment.

To set out simple Circular curve. (horizontal & vertical)

Determination of height of an inaccessible point by Trigonometrical Levelling.

To carryout open Traverse with Total station.

To carryout closed Traverse with Micro-optic Theodolite.

To carryout Longitudinal and Cross-sectional leveling using Automatic Level.

SUB CODE: CE 414

FOURTH SEMISTER
HYDRAULICS AND HYDRAULIC MACHINES

Theory-100 marks.
Sessional-50 marks.
Practical- 50 marks.
Time- 3 Hours.

Viscous flow:

Viscosity- dynamic and kinematic; Equation of motion- Navier- Stokes equation; Laminar flow in circular pipes- Hagen Poiseuille equation, flow between parallel plates- Couette flow, plane Poisouille flow.

Turbulent flow:
Eddy viscosity, Pandtle mixing length theory, velocity distribution over smooth and rough surfaces.

Boundary Layer Theory:
Advanced pipe flow: Boundary layer thickness- displacement, momentum and energy thickness, Laminar and turbulent boundary layer along a flat plate- momentum integral equation; Laminar sub-layer.

Flow around Submerged Bodies:
Drag and lift, pressure and friction drag on sphere, cylinder and disc. Separation of flow -Kerman vortex street, lift-cylinder with circulation, Magnus effect, Drag and Lift coefficients.

Smooth and rough pipes, variation of friction factor, moody's diagram, pipe network analysis-Hardy Cross method, water hammer in pipes- rigid and elastic water column theories, gradually and instantaneous closure of valves, surge tank.

Open Channel flow:
Normal depth, specific energy, critical depth and critical velocity, prismatic and non-prismatic channel section, types of bed slope. Gradually varied flow-surface profile, equation of gradually varied flow-direct step method, backwater curve, rapidly varied flow-hydraulic jump in horizontal rectangular channel, depth and length of jump, loss of energy.

Impact of Jet:
Impulse momentum principal, momentum of momentum, force of jet on fixed, hinged and moving plate, including curved plate, water wheel and radically rotating curved vanes.

Turbines:
Classification, Impulse and reaction turbines, work done, power and efficiencies, Pelton wheel, Francis turbine, Kalpan and Propeller turbine, draft tube, unit quantities, specific speed.

Pumps:
Centrifugal pump- velocity triangle, work done, manometric head, efficiency, minimum starting speed, multi stage pump.
Reciprocating pump-discharge, indicator diagram, effects of acceleration and friction, Air vessels.

Other Machines:

Hydraulic Ram, Accumulator, Intensifier, Hydraulic Press and jack.

FOURTH SEMISTER
HYDRAULICS AND HYDRAULIC MACHINES

Total Marks: 50

1. Determination of the sequent depths in Hydraulic Jumps.

2. Experiment on the impact of Jets.

3. Determination of critical velocity in pipe flow cases.

ENGINEERING GEOSCIENCE
SUB CODE: CE 415

FOURTH SEMISTER

Theory-100 marks.
Sessional-50 marks.
Practical- 50 marks.
Time- 3 Hours.

Introduction to Earth Science, Earth materials, Earth Sciences in Civil Engineering.

Geological function of wind, running water and glacior modification of landscapes.

Brief outline of the rock-forming minerals, their physical properties-selected rock- forming minerals from-quartz, feldspar pyroxene, mica garnet, olivine and amphibole groups. Their economic importance clay minerals-classification, structure.

Mode of formation of igneous, metamorphic and sedimentary rocks- their occurrences, forms, texture and structure, classifications and mineralogical compositions, geological and Engineering properties of granite, gabore, rhyelite, diorit, dolorite, granodierite, pegmatits, basalt, conglemorate, sand-stone, lime-stone, shale, phyllite, schist, gnoise, amphibolite, quartzite and marblo.

Primary and Secondary structures of rocks, influence of stereos and strain on rocks and resulting deformation-folds, faults, joints-causes of formation, classification, Engineering significance, unconformities, overlap outlier and inlier.

Fundamental principles of stratigraphy, standard stratigraphic column. General review of the geological history of India with particular reference to procambrian, gendwana and tertiary group. Elementary principles relating to geological and geophysical methods of prospecting. Their utility in the field of Civil Engineering.

Geosciences bases investigations of sites for dams, reservoirs, tunnels, highways and bridges. Land-slide causes, types, types and effects on Engineering construction-prevention.

Surface and underground water, surfaces, accumulation and migration of water table, ground water survey and ground water provinces, Cartesian water, classification of aquifers.

Earthquake: Types, causes, Earthquake waves, magnitude and intensity effect on engineering constructions-precaution seismic belts of India.

Construction materials: Building and road, rock quarrying with special reference to rock blasting and few related problems. Rock boring and simple idea of R.Q.D. (rock quality designation) and some related problems.

Laboratory works: Megascopic studies of some important minerals and rocks. Problems of dip and strits and completion of outcrops. Borehole correlation problems. Geological maps and geological sections. Study of top-sheets.