SCHEME OF INSTRUCTION AND SYLLABUS

(2nd YEAR TO 4th YEAR)

B.E. (CIVIL ENGINEERING)

&

B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

Department of Civil Engineering
Andhra University College of Engineering (Autonomous)
Visakhapatnam-530 003
Andhra Pradesh, India

I/IV B.E/B.TECH (FOUR YEAR COURSE) - **SEMESTER SYSTEM**
(With effect from **2006-2007** admitted batch onwards)

I & II SEMESTERS

CODE NO.	COURSE	Credits	Periods L/T/Lab	Exam Hours	Sessional Marks	Exam *Marks*	Total Marks
ENG 1001	English	2	2+1	3	30	70	100
ENG 1002	Mathematics – I	4	3	3	30	70	100
ENG 1003	Mathematics – II	4	3	3	30	70	100
ENG 1004	Physics Theory	4	3	3	30	70	100
ENG 1005	Chemistry Theory	4	3	3	30	70	100
ENG 1006	History of Science And Technology	2	3	3	30	70	100
ENG 1007	Comp. Prog. And Num. Methd	4	3	3	30	70	100
ENG 1008	Engineering Graphics	5	2+4	3	30	70	100
ENG 1009	Physics Laboratory	2	3	3	50	50	100
ENG 1010	Chemistry Laboratory	2	3	3	50	50	100
ENG 1011	Workshop	2	3	3	50	50	100
ENG 1012	Programming Laboratory	2	3	3	50	50	100
Total		***37***	**39**		**440**	**760**	**1200**

II / IV B.E. (CIVIL ENGINEERING)
&
II / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

1st Semester:

Code	Title of Course	L	T	P	Total	Univ. Exam.		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE211	Engineering Mathematics – III	4			4	3	70	30	100	4
CE212	Engineering Mechanics	4	2		6	3	70	30	100	4
CE213	Mechanics of Solids	3	2		5	3	70	30	100	4
CE214	Building Materials and Building Construction	5			5	3	70	30	100	4
CE215	Surveying – I	4			4	3	70	30	100	4
CE216	Engineering Geology	4		2	6	3	70	30	100	4
CE217	Strength of Materials Laboratory			3	3	3	50	50	100	2
CE218	Survey Field Work-I			3	3	3	50	50	100	2
		24	**4**	**8**	**36**		**520**	**280**	**800**	**28**

2nd Semester:

Code	Title of Course	L	T	P	Total	Univ. Exam.		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE221	Engineering Mathematics-IV	4			4	3	70	30	100	4
CE222	Structural Analysis-I	4	2		6	3	70	30	100	4
CE223	Fluid Mechanics-I	4	2		6	3	70	30	100	4
CE224	Surveying-II	4	1		5	3	70	30	100	4
CE225	Building Planning & Design	3		3	6	3	70	30	100	4
CE226	Environmental Studies	4			4	3	70	30	100	2
CE229	Human Values & Professional Ethics	2			2			100	100	2
CE227	Survey Field Work-II			3	3	3	50	50	100	2
CE228	Fluid Mechanics Lab. – I			3	3	3	50	50	100	2
		23	**5**	**9**	**37**		**520**	**280**	**800**	**26**

III / IV B.E. (CIVIL ENGINEERING)
&
III / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

1st Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE311	Reinforced Concrete Structures – I	4	1		5	3	70	30	100	4
CE312	Steel Structures – I	4	1		5	3	70	30	100	4
CE313	Fluid Mechanics – II	4	1		5	3	70	30	100	4
CE314	Geotechnical Engineering- I	4	1		5	3	70	30	100	4
CE315	Environmental Engineering- I	4			4	3	70	30	100	4
CE316	Estimating and Quantity Surveying	4	2		6	3	70	30	100	4
CE317	Environmental Engg. Lab			3	3	3	50	50	100	2
CE318	Geotechnical Engg. Lab-I			3	3	3	50	50	100	2
CE319	Soft Skills			2	2			100	100	1
FE 01	Free Elective -I	4	-	-	4	3	70	30	100	4
		28	**6**	**8**	**42**		**590**	**410**	**1000**	**33**

2nd Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE321	Structural analysis – II	4	2		6	3	70	30	100	4
CE322	Reinforced Concrete Structures – II	4	2		6	3	70	30	100	4
CE323	Steel Structures – II	4	2		6	3	70	30	100	4
CE324	Geotechnical Engineering-II	4	1		5	3	70	30	100	4
CE325	Fluid Mechanics – III	4	2		6	3	70	30	100	4
CE326	Elective -I	4	2		6	3	70	30	100	4
CE327	Geotechnical Engg. Lab. II			3	3	3	50	50	100	2
CE328	Concrete Laboratory			3	3	3	50	50	100	2
	Industrial Training	To be held during summer vacation and evaluated[@] in the 1st Semester of IV year								
		24	**11**	**6**	**41**		**520**	**280**	**800**	**28**

@ Assessment as indicated along with the requirements given in the syllabus part.

ELECTIVE – I (COURSE NO. CE 326)

CE326 A Repair and Rehabilitation of structures
CE326 B Remote Sensing and Geographical Information Systems (G.I.S.)

FREE ELECTIVE – I.

IV / IV B. E. (CIVIL ENGINEERING)

SCHEME OF INSTRUCTIONS

1st Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Sels. Marks	Total Marks	Credits
						Hrs	Marks			
CE411	Water Resource Engineering – I	3	2		5	3	70	30	100	4
CE412	Transportation Engineering – I	3	1		4	3	70	30	100	4
CE413	Project Planning and Management	4	2		6	3	70	30	100	4
CE414	Environmental Engineering – II	4			4	3	70	30	100	4
CE415	Elective - II	4	2		6	3	70	30	100	4
CE416	Computer applications in Civil Engineering (Lab)	3		3	6	3	50	50	100	4
CE417	Transportation Engineering Lab.			3	3	3	50	50	100	2
CE418	Fluid Mechanics Lab. – II			3	3	3	50	50	100	2
CE419	Industrial Training@							100	100	2
		21	**9**	**9**	**39**		**500**	**400**	**900**	**30**

@ held during summer vaction after III year 2nd semester. Assessment as indicated along with the requirements given in the syllabus part.

2 nd Semester

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE421	Transportation Engineering II	3	1		4	3	70	30	100	4
CE422	Water Resources Engineering II	3	2		5	3	70	30	100	4
CE423	Elective – III	4	2		6	3	70	30	100	4
CE424	Elective – IV	4	2		6	3	70	30	100	4
CE425	Project Work			6	6	--	50	50	100	8
FE 02	Free Elective-II	4			4	3	70	30	100	4
		18	**7**	**6**	**31**		**400**	**200**	**600**	**28**

ELECTIVE – II (COURSE NO. CE 415)

CE415 A Environmental Impact Analysis.
CE415 B Structural Dynamics
CE415 C River Engineering

ELECTIVE – III (COURSE NO. CE 423)

CE423 A Finite Element Methods of Analysis
CE423 B Solid Waste management
CE423 C Soil Dynamics & Machine Foundation
CE423 D Principles of Water Quality Management

ELECTIVE – IV (COURSE NO. CE 424)

CE424 A Air Pollution Control
CE424 B Ground Improvement Techniques
CE424 C Prestressed Concrete
CE424 D Coastal Engineering
CE424 E Hydraulic Structures

I/IV B.E/B.TECH (FOUR YEAR COURSE) - **SEMESTER SYSTEM**
(With effect from **2006-2007** admitted batch onwards)

I & II SEMESTERS

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ENG 1005	Chemistry Theory	4	3	3	30	70	100
ENG 1006	History of Science And Technology	2	3	3	30	70	100
ENG 1007	Comp. Prog. And Num. Met4	4	3	3	30	70	100
ENG 1008	Engineering Graphics	5	2+4	3	30	70	100
ENG 1009	Physics Laboratory	2	3	3	50	50	100
ENG 1010	Chemistry Laboratory	2	3	3	50	50	100
ENG 1011	Workshop	2	3	3	50	50	100
ENG 1012	Programming Laboratory	2	3	3	50	50	100
Total		***37***	**39**		**440**	**760**	**1200**

ENGLISH

(Common to all the Branches – B.E./B.Tech/ Dual degree ME/ M. Tech Courses and Architecture)

Theory Hours	Sessional Marks	External exam marks	Total Marks
3	30	70	100

Vocabulary: Word Search, Discuss and Note – Word Quiz – A List of 100 Basic Words – One Word Substitutes – 100 Difficult Words, Synonyms, Antonyms, Idioms, Technical terms

2)Grammar: Types of Sentences, Verbs, Adverbs, Pronouns, Adjectives, Gerunds & Infinitives, Articles, Quantifier, Punctuation, Prepositions, Conjunctions, Exclamation.

3)Reading: Famous People – What is Personality, Personality Based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A

Review of IPL: The Inside Story, Marck Zuckerberg: World's Youngest Billionaire – Solar Power: The Way Forward, From the Very Small to the Very Large

4)Listening: Life in a Hostel – Eating Away those Blues!, Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea – An Interview with a Woman Engineer

5)Speaking: Your favourite Holiday Destination – Describe yourself – Why we need to Save OurTigers-a Dialogue – Your First Interview – Pair Work: Setting up a New Business – Great Engineering Achievements.

6)Scenario: Sharing a Flat – Living in the Twenty-First Century – Global warming – Reality TV – Recession – The Sky-High Project.

7)Writing: Writing Sentences – Using Your dictionary – Paragraph Writing, Arguing a Case – Essay, Formal Letters, Emails, Reports, Presentations.

8)Life Skills and Core Skills: Self Awareness and Self Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism, Ethics – Innovativeness and Creativity.

Text Book:

Life Through Language: A Holistic Approach to Language Learning. Board of Editors, Pearson Publishers, India. 2013.

Reference Books:

1.*Basic Vocabulary.* Edgar Thorpe, Showick Thorpe. Pearson P. 2008.
2.*Quick Solutions to Common Errors in English.* Angela Bunt. MacMillan P. 2008
3.*ABC of Common Grammatical Errors.* Nigel D Turton. McMillan P. 1995.
4.*Business Communication Strategies.* Mathukutty Monippally. Tata Mc Grahill P. 2009

ENG 1002 Mathematics-I

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

I Partial Differentiation and its applications:

Functions of Two or More Variables, Partial Derivatives, Homogeneous Functions- Euler's Theorem, Total Derivative, Differentiation of Implicit Functions, Geometrical Interpretation- Tangent Plane and Normal to a surface. Change of Variables, Jacobians, Taylor's Theorem for functions of two variables, Errors and approximations. Total Differential, Maxima and Minima of functions of two variables. Lagrange's method of undetermined multipliers, Differentiation under the integral sign – Leibnitz Rule.

II Solid geometry:

Equation of a plane. Equations of Straight line. Condition for a line to lie in a plane. Coplanar lines. Shortest distance between two lines. Intersection of three planes. Equation of Sphere, Tangent plane to a sphere. Cone, cylinder, Quadratic surfaces.

III Multiple integrals and their applications:

Double integrals. Change of order of integration. Double integrals in Polar Co-ordinates, Areas enclosed by plane curves. Triple integrals. Volume of solids. Change of variables. Area of a curved surface. Calculation of Mass, Center of gravity, Center of pressure, Moment of inertia. Product of inertia. Principal Axes. Beta function, Gamma function. Relation between Beta and Gamma functions. Error function of Probability integral.

IV Infinite series:

Definitions. Convergence, Divergence and oscillation of a series, General properties, series of positive terms, comparison test, Integral test. D'Alembert's Ratio test. Raabe's test. Logarithmic test. Cauchy's Root test. Alternating series- Leibnitz's rule, Series of positive or negative terms. Power series. Convergence of Exponential, Logarithmic and Binomial series. Uniform convergence. Weirstrass M-test. Properties of uniformly convergent series (all tests without proofs).

V Fourier series:

Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Odd and even periodic functions – Expansions of odd and even periodic functions. Half range series. Parseval's formula, Practical Harmonic analysis.

Text Books:

1. Scope and Treatment as in "Higher Engineering Mathematics" by Dr. B.S Grewal, 42nd edition, Khanna publishers.

Reference Books:

1. A text book of Engineering Mathematics by N.P.Bali and Ieyangar, Lakshmi publications.
2. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
3. Higher Engineering Mathematics by B.V Ramana, Tata McGraw Hill Company.

ENG 1003 Mathematics-II

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

I Linear Algebra:

Rank of a Matrix. Eigen values Eigen vectors of a Matrix. Cayley Hamilton Theorem. Consistency of linear simultaneous algebraic equations, Matrix Inversion, Gaussian Elimination, LU factorization. Jacobi and Gauss-Seidel iterative Methods for solving simultaneous equations. Determination of Eigen Values using forward iteration. (Rayleigh's power method), Hermitian and skew Hermitian matrices. Unitary Matrix, Quadratic forms and Canonical forms.

II Ordinary Differential Equations Of First Order And Its Applications:
Formation of differential equations. Solutions of a differential equation-geometrical meaning. Equations the first order and first degree, Variables separable, Homogeneous equations. Linear equations. Bernoulli's equations. Exact equations. Equation reducible to exact equations. Equations of the first order and higher degree, Clairaut's equation.

Applications: Orthogonal trajectories, Simple Electric circuits. Chemical reactions. Newton's law of cooling only.

III Linear Differential Equations:
Higher order linear differential equations with constant coefficients. Cauchy's and Legendre's linear equations, Simultaneous linear equations with constant coefficients.

IV Series solutions of differential equations:
Series Solutions of ODE-Frobenius method (when x=0 is a regular singularity),Bessel's equation, equations reducible to Bessel's equations. Legendre Polynomials, Rodrigue's formula, Generating function. Recurrence relations. Orthogonality relation for Bessel's functions and Legendre Polynomials.

V Laplace transforms:
Transforms of elementary functions. Properties of Laplace Transforms, Existence conditions, Inverse transforms, Transforms of derivatives, Transforms of Integrals. Multiplication by 't'- division by 't'. Convolution theorem. Applications to ordinary differential equations and simultaneous linear equations with constant coefficients. Laplace transforms of Unit step function, Unit Impulse function and Periodic functions.

Text Books:

1. Scope and Treatment as in "Higher Engineering Mathematics" by Dr. B.S Grewal, 42nd edition, Khanna publishers.

Reference Books:

1. A text book of Engineering Mathematics by N.P.Bali and Ieyangar, Lakshmi publications.
2. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
3. Higher Engineering Mathematics by B.V Ramana, Tata McGraw Hill Company.

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Thermodynamics
Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Entropy, Second law of thermodynamics, Entropy and disorder, Entropy and Probability, Third law of thermodynamics. Thermography and its Applications.

Electromagnetism
Concept of electric field – Point charge in electric field, dipole in an electric field. Gauss law, some applications, electric potential and field strength, potential due to a point charge and dipole.

Magnetic field – magnetic force on current, torque on current loop, Hall effect, Ampere's law, B near a long wire, B for a solenoid and Toroid. The Biot-Savart,s Law. B for a circular Current loop.

Faraday's law of induction. Lenz's law, Calculation of Inductance. L-R Circuit. Energy stored in Magnetic field. Induced magnetic fields, Displacement current. Energy density in Electric and Magnetic fields, Poynting Vector S.

Maxwells equations and Electromagnetic waves (Both differential and Integral forms). Magnetic properties of materials. Paramagnetism, Diamagnetism, Ferromagnetism, Ferrites and its applications.

Optics
Interference – Principles of superposition – Young's Experiment – Coherence – Interference of thin films, Wedge shaped film, Newtons Rings, Michelson Interferometer and its applications.

Diffraction – Single slit (Qualitative and quantitative treatment).

Polarisation – Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization and detection.

Lasers and Fibre Optics
Spontaneous and stimulated emissions, population inversions, Ruby laser, Gas laser, Semiconductor laser, Applications of lasers.

Fibre Optics, Optical Fibre and Total Internal Reflection, Acceptance Angle and cone of a fibre, Fibre optics in communications, Optical parts in Fibre. Fibre Optic Sensors.

Ultrasonics
Production of Ultrasonics by Magnetostriction and Piezoelectric effects – Ultrasonics and diffraction pattern, Applications of Ultrasonics.

Modern Physics

The quantization of energy, Photoelectric effect, De Broglie concept of matter waves, uncertainty principle, Schrodinger wave equation, application to a particle in a box.

Elementary concepts of Maxwell-Boltzman, Bose-Einstein's and Fermi Dirac Statistics. Fermi Dirac Distribution function (no derivations).

Free electron theory of metals, Band theory of solids, Kronig Penny Model, Metals, Insulators and Semiconductors. Ferroelectrics and their applications

Super conductivity, Meisner Effect, Types of Superconductors and Applications of Superconductors.

Nanophase materials – Synthesis, characterization of nanostructured materials, properties and applications.

Renewable energies – Solar, wind and tidal – Applications

Books Recommended

1. Engineering Physics by R.K. Gaur and S.D. Gupta
2. Physics by David Halliday and Robert Resnick – Part I and Part II
3. Modern Engineering Physics by A.S. Vadudeva
4. University Physics by Young and Freedman
5. Materials Science by V. Rajendra and A. Marikani
6. Nonconventional Energy by Ashoke V. Desai

ENG 1005 Chemistry

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

1. Water Chemistry and pollution:

Water Chemistry: Sources of water - impurities – Hardness and its determination – W.H.O. limits. Boiler troubles and their removal. Water softening methods – Lime Soda, Zeolite and Ion exchange. Municipal water treatment – Break point chlorination. Desalination of Sea Water - Electrodialysis and Reverse osmosis methods.
Water pollution: Source – BOD – COD – Sewage treatment - preliminary, primary, secondary and tertiary.
Air Pollution: Source – Air pollutants – CO , SOx , NOx , Hydrocarbons and particulates. Acid rain – Green House effect – control of Air pollution (General).

2. Solid State Chemistry:

Classification of Solids – Types of Crystals – Properties - imperfections in crystals. Band theory of solids. Chemistry of Semiconductors - Intrinsic, extrinsic, compound and defect. Organic semiconductors and superconductivity. Purification of solids by zone refining - Single crystal growth – epitaxial growth. Elementary ideas on liquid crystals.

3. Energy Sources:

Thermal Energy: Coal- Ranking of coal - analysis (proximate and ultimate) Calorific value and determination (Bomb calorimeter method) – COKE – Manufacture – Otto Hoffmann's process – Applications.
Chemical Energy: Electrode potential – Calomel electrode – Galvanic cells – primary secondary – Acid and alkaline cells – fuel cells.
Nuclear Energy : Fission and fusion – power rectors – Atomic pile applications .
Solar Energy : Methods of utilization – thermal conversion – Liquid Flat – Plate collector – Photovoltaic conversion - solar cell - Applications.

4. Corrosion Chemistry :

Origin and theories of corrosion – Types of corrosion - Factors affecting corrosion – corrosion control methods . Protective coatings –Metallic coatings – Chemical conversion coatings - phosphate , chromate , Anodized . Organic Coating – paints – special paints – Varnishes and lacquers.

5. Fuels and Lubricants:

Petroleum – refining - Motor fuels – Petrol and Diesel Oil - Knocking – Octane number - Cetane number. Synthetic petrol – Fisher - Tropsch and Bergius methods. LPG and CNG - Applications. Rocket fuels -Propellants - Classification.
Lubricants: Classification - mechanism - properties of lubricating oils - Selection of lubricants for Engineering applications.

6. Polymers and Plastics:

Definition – Types of polymerization – Mechanism of addition polymerization. Effect of polymer sructure on properties. Plastics – Thermoplastic resins and Thermosetting resins - Compounding of plastics – Fabrication of plastics. Preparation and properties of cellulose

derivatives - Vinyl resins-Nylon(6,6)- bakelites – polycarbonates - epoxy resins. Reinforced plastics. Conducting polymers. Engineering applications of polymers.

7. Building Materials:

Portland Cement: Manufacture - Dry and Wet process. Setting and hardening of cement - Cement concrete - RCC - Decay of concrete - special cements.

Refractories: Classifications - properties - Engineering applications.

Ceramics: Classification - Properties - uses.

Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. A text book of Engineering Chemistry, - Allied Publishers Balasubramanian et.al.,
5. Material Science and Engineering V. Raghavan - Prentice-Hall India Ltd.,

ENG 1006 History of Science and Technology

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

1. Historical Perspective :
The Nature of Science and Technology , Roots of Science and Technology in India , Science and Society , Scientists and Society , Science and Faith and The Rise of Applied Sciences.

2. Polices and Plans After Independence :
Nehru's vision of Science for Independent India, Science and Technology Developments in the New Era Science and Technology Developments during the Five Year Plan Periods and Science and Technology Policy Resolutions.

3. Research and Development (R&D) in India :
Expenditure in R&D, Science and Technology Education, Research Activities and Promotion of Technology Development, Technology Mission, Programms Aimed at Technological self Reliance, Activities of Council of Scientific and Industrial Research (CSIR).

4. Science and Technological Developments in Major Areas :
Space – Objectives of Space Programms, Geostationary Satellite Services – INSAT System and INSAT Services Remote Sensing Applications, Launch Vehicle Technology
Ocean Development – Objectives of Ocean Development, Biological and Mineral Resources, Marine Research and Capacity Building;
Defense Research --- Spin –off Technologies for Civilian Use;
Biotechnology--Applications of Biotechnology in – Medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of Biosensors and Animal Husbandry;
Energy – Research and Development in Conservation of Energy , India's Nuclear Energy Programme –Technology Spin –offs.

5. Nexus Between Technology Transfer and Development :
Transfer of Technology—Types, Methods, Mechanisms, Process, Channels and Techniques: Appropriate Technology, Technology Assessment, Technological Forecasting, Technological Innovations and Barriers of Technological Change.

Test Books :
1. Kalpana Rajaram , **Science and Technology in India,** Published and Distributed by Spectrum Books (P) Ltd., New Delhi-58.
2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East – West Press (P) Ltd., New Delhi.

Reference Books :
1. Ramasamy , K. A. and Seshagiri Rao, K.,(Eds**.) Science, Technology and Education for Development,** K., Nayudamma Memorial Science Foundation, Channai-8.
2. Kohili, G. R., **The Role and impact of Science and Technology in The development of India,** Surjeet Publications.
3. Government of India, **Five Year Plans**, Planning Commission, New Delhi. Sharma, K. D. and Quresh M. A., **Science, Technology and Development**, Sterling Publications (p) Ltd. New Delhi.

ENG 1007 Computer Programming and Numerical Methods

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Objectives:

To make the student familiar with programming in C and enable the student to implement the numerical methods described in this course using C as Programming Language

Section A

Computer Programming in C

Basics: Variables – Constants – Expressions – Operators and their precedence and associativity. Basic input and output statements. Control structures. Simple programs in C using all the operators and control structure.

Functions: Concept of a function – Parameters and how they are passed – Automatic Variables – Recursion – Scope and extent of variables. Writing programs using recursive and non-recursive functions.

Arrays and Strings: Single and multidimensional arrays-Character array as a string- Functions on strings. Writing C Programmes using arrays and for string manipulation.

Structures: Declaring and using structures-Operations on structures – Arrays of structures-User defined data types-Pointers to using files.

Files: Introduction –file structure- File handing functions- file types- Files- Error handing- C Programming examples for using files.

Section B

Computer Oriented Numerical Methods

1. Basic Concepts: Preliminary Concepts of Algorithms-Flow Charts and their execution traces- A Simplified Model of a Computer.
2. Representation for Characters and Numbers: Representation for integer and real numbers. Effect of finite representation on arthimatic operations for example overflow, underflow, associativity and normalization. Some elementary methods for overcoming these limitations.
3. Numerical Methods: Notation of round-off and truncation errors, numerical methods of finding roots of an algebraic equation of one variable. Successive bisection method, False position method, Newton Raphson method and Secant method.
4. Solutions of simultaneous Algebraic Equations; Gauss elimination method and Gauss Seidal methods.
5. Interpolation: Lagrange's Interpolation and difference table methods.
6. Numerical integration: Simpson's rule, Gaussian Quadrature Formula.
7. Numerical Solution of Differential Equation: Euler's method, Taylor's seriesmethod and Runge-Kutta method.

Books:

1. Section A: Programming with C by K.R.Venugopal& Sudeep R Prasad
2. Section B: Introduction to Numerical Methods by S.S Sastry
3. Elementary Numerical Methods by S.D.Conte

Reference:

1. C Programming Language by Kerningham & Ritchie

ENG 1008 Engineering Graphics

Lectures/week = 2+4 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Introduction:
Drawing Instruments and uses. Lettering scales in common use.

Curves:
Curves used in Engineering Practice, conic sections, construction of conics by different methods, rectangular-hyperbola, cycloidal curves, trochoids, epi and hypo-cycloids. involutes and Archemedian spiral.

Orthographic Projections:
Projection of points, projection of straight lines, traces of a line, projection of planes and projection on auxiliary planes.

Solids and Developments:
Projection of solids in simple positions, projection of solids with axis inclined to one of the reference planes and parallel to the other, projection of solids with axis inclined to both the reference planes. Projection of spheres. Development of surfaces of solids. Development of transition piece connecting a square and circular pipe. Helices and screw threads.

Sections and Intersections:
Sections of different solids and true shape of sections. Intersection of surfaces-simple problems with cylinders, prisms and cones.

Isometric and Perspective Projections:
Isometric projection and conversion of orthographic projection into isometric projection. Perspective projection. Theory of visual ray method and vanishing point method. Simple problems involving regular geometrical solids.

Textbook:
1. Elements of Engineering Drawing by N.D. Bhatt

Reference:
1. Engineering Graphics by K.L. Narayana and P. Kannaiah

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

12 of the following experiments must be completed:

1. Lee's method- determination of coefficient of thermal conductivity of a bad conductor

2. Melde's experiment-determination of the frequency of an electrically maintained tuning fork.

3. Newton's rings – determination of radius of curvature of a convex lens.

4. Diffraction grating-determination of wavelengths in mercury line spectrum-using spectrometer

5. Determination of Cauchy's constants using Spectrometer and mercury light.

6. Wedge method-det. of thickness of a paper by forming parallel interference fringes.

7. Michelson's interferometer- a) det. of wavelength of light b) Resolution of spectral lines.

8. Det. of using calcite crystal.

9. Optical Bench – a) Young's double slit b) Lloyd's mirror c) biprism d) diffraction at an edge e) Thickness of wire

10. Ultrasonic Diffraction – Velocity of ultrasonic waves in liquids.

11. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee's apparatus

12. Calibration of voltmeter using potentiometer

13. Carey Foster's bridge a) laws of resistance b) temperature coefficient of resistance

14. B-H curves – determination of hysterisis loss

15. Calendar and Barnes method – determination of specific heat of water

16. Hall effect – a) Determination of hall coefficient B) determination of charge density

17. Photoelectric effect – a) characteristics of photoelectric cell b) det. of Planck's const.

18. Determination of Rydberg constant using hydrogen discharge tube

19. Determination of e/m of am electron – Thomson's method

20. Determination of band gap of semi conductor.

ENG 1010 Chemistry Laboratory

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

List of Experiments:

01. Determination of Sodium Carbonate.
02. Determination of Sulfuric acid using a strong base.
03. Estimation of Iron (II) using Potassium Permanganate.
04. Estimation of Oxalic Acid using Potassium Permanganate.
05. Determination of volume strength of Hydrogen Peroxide.
06. Estimation of Calcium in a sample of Portland cement.
07. Estimation of Chromium (VI) using Ferrous Ammonium Sulphate.
08. Estimation of Copper (II) using Sodium thiosulphate.
09. Analysis of Bleaching powder for Chlorine content.
10. Estimation of Zinc by EDTA method.
11. Determination of hardness of a water sample (EDTA Method).
12. Determination of alkalinity of a water sample.

Demonstration Experiments:

13. Determination of Viscosity of a Lubricating oil.
14. Preparation of Copper pigment.
15. Preparation of Phenol-Formaldehyde resin.
16. Digital pH meter.
17. Digital potentiometer.
18. D.O. Analyser.

ENG 1011 Workshop

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

1. Carpentry:
Bench work, tools used in carpentry.
Jobs for class work – half lap joint, mortise and tenon joint, half –lap dovetail joint, corner dovetail joint, bridle joint.

2. Sheet Metal:
Tools used in sheet metal work. Laying developments of sheet metal jobs, soldering.
Jobs for class work – square tray, taper side tray, funnel, elbow pipe.

3. Fitting:
Tools used in fitting work. Different files, chisels, hammers and bench vice.
Jobs for class work – hexagon, rectangular, circular and triangular fits. External and internal threads with dies and taps.

Reference
1. Elements of Workshop technology, Vol.1 by S.K. and H.K. Hajra Choudary

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

1. Write a program to read x,y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while)

3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.

6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

8. Given two points on the surface of the sphere, Write a program to determine the smallest arc length between them.

9. Implement bisection method to find the square root of a given number to a given accuracy.

10. Implement Newton Raphson method to det. a root of polynomial equation.

11. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange's interpolation.

12. Write a function which will invert a matrix.

13. Implement Simpson's rule for numerical integration.

14. Implement Gaussian quadrature for numerical integration.

15. Write a program to solve a set of linear algebraic equations.

II / IV B.E. (CIVIL ENGINEERING)
&
II / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

1st Semester:

Code	Title of Course	L	T	P	Total	Univ. Exam.		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE211	Engineering Mathematics – III	4			4	3	70	30	100	4
CE212	Engineering Mechanics	4	2		6	3	70	30	100	4
CE213	Mechanics of Solids	3	2		5	3	70	30	100	4
CE214	Building Materials and Building Construction	5			5	3	70	30	100	4
CE215	Surveying – I	4			4	3	70	30	100	4
CE216	Engineering Geology	4		2	6	3	70	30	100	4
CE217	Strength of Materials Laboratory			3	3	3	50	50	100	2
CE218	Survey Field Work-I			3	3	3	50	50	100	2
		24	**4**	**8**	**36**		**520**	**280**	**800**	**28**

II / IV B.E. (CIVIL ENGINEERING)
&
II / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

1 st SEMESTER

CE211 ENGINEERING MATHEMATICS – III

Vector Calculus: Differentiation of Vectors, Curves in Space, Velocity and acceleration, relative velocity and acceleration, scalar and vector point functions, vector operator. $\vec{\nabla}$ V, $\vec{\nabla}$ applied to scalar point functions, gradient, V applied to vector point functions, divergence and curl. physical interpretations of $\vec{\nabla}$ .F and $\vec{\nabla}$ xF, $\vec{\nabla}$ applied twice to point functions, $\vec{\nabla}$ applied to products of point functions, integration of vector, line integral, circulation, work surface integral-flux, Green's theorm in the plane, Stoke's theorem, volume integral, divergence theorem, irrotational and solenoidal fields, Green's theorem, Introduction of orthogonal curvilinear coordinates: Cylindrical, spherical and polar coordinates.

Introduction of Partial Differential Equations : Formation of partial differential equations, solutions of PDEs, equations solvable by direct integration, linear equations of first order, homogeneous linear equations with constant coefficients, rules for finding the complimentary function, rules of finding the particular integral, working procedure to solve homogeneous linear equations of any order, non homogeneous linear equations.

Applications of Partial Differential Equations: Method of separation of variables, Vibrations of a stretched string-wave equations, one-dimensional and two-dimensional heat flow equations, solution of Laplace equation, Laplace equation in polar co-ordinates.

Integral Transforms ; Introduction, definition, Fourier Integral, Sine and Cosine Integrals, Complex forms of Fourier Integral, Fourier Transform, Fourier Sine and Cosine Transforms, Finite Fourier Sine and Cosine Transforms. Properties of F-Transforms, Convolution Theorm for F-Transforms, Parseval's Identity for F-Transforms, Fourier Transforms of the derivatives of a function, applications to boundary value problems, using inverse Fourier Transforms only.

TEXT BOOK:

1. Higher Engineering Mathematics (34th edition 1998) by B.S. Grewal

References:

1. A Text Book on Engineering Mathematics by M.P. Bali et al.
2. Higher Engineering Mathematics by M.K. Venkata Raman
3. Advanced Mathematics for Engineering Students, Vol-2 & 3, by Narayanan et al.
4. Advanced Engineering Mathematics by Erwin Kreyszig.
5. Engineering Mathematics by P.P. Gupta.
6. Advanced Engineering Mathematics by V.P. Jaggi and A.B. Mathur.
7. Engineering Mathematics by S.S. Sastry.
8. Advanced Engineering Mathematics by M.L. Dass.

CE212 ENGINEERING MECHANICS

Basic Concepts : Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple.
Resultants of Force Systems, Possible resultants of different types of force systems – Resultant of a concurrent, coplanar force system – Resultant of a non-concurrent coplanar force system – Resultant of a concurrent non-coplanar force system – Resultant of a parallel, non-coplanar force system – Resultant of a system of couples in space – Resultant of non-concurrent, non-coplanar, non-parallel force system – screw of Wrench.

Equilibrium : Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar non-parallel force system.

Centroids and Centres of Gravity: Centre of gravity of parallel forces in a plane – Centre of gravity of parallel forces in space – centroids and centres of gravity of composite bodies – Theorems of Pappus – Distributed Loads on Beams.

Moments of Inertia, Definition – Parallel axis theorm for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas – Parallel axis and parallel plane theorems for masses – Moments of inertia of masses by integration – Radius of gyration of mass – Moments of inertia of composite masses.

Friction : Nature of friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction – Problems involving frictional forces – Frictional forces on flexible bands and belts – Rolling friction.
Method of Virtual Work: Principle of virtual work – Equilibrium of ideal system – Stability of equilibrium.

Kinematics : Absolute Motion : Introduction – Recapitulation of basic terminology of mechanics – Newton's Laws – Introduction to Kinematics of Absolute Motion – Rectilinear motion of a particle – Angular motion of a line – Curvilinear motion of a particle using rectangular components – Motion of projectiles – Curvilinear motion using Radial and Transverse Components – (Simple Problems only) – basics of simple harmonic motion (Simple problems) – Motion of rigid bodies.
Kinematics: Relative Motion: Introduction to kinematics of relative motion – Relative displacement – Relative velocity – Instantaneous centre – Relative acceleration.

Kinetics: Introduction to Kinetics – Force, Mass and Acceleration approach – Newton's Laws of motion – Equation of motion for a particle. Motion of the mass centre of a system of particles – D Alembert's principle – Rectilinear translation of a rigid body – Curvilinear translation of a rigid body – Rotation of a rigid body – Plane motion of a rigid body – Reserved effective forces and couples and their use in Dynamic Equilibrium method.

Kinetics : Work and Energy approach – Work done by a force – Work done by a couple – Work done by a force system – Energy: Potential energy – Kinetic energy of a particle – Kinetic energy of a rigid body – Principle of Work and kinetic energy – Conservation of energy – Power and efficiency.
Impulse – Momentum approach – Linear impulse – Linear momentum – Principle of linear impulse and linear momentum – Conservation of linear momentum – Elastic impact – Angular impulse – Angular momentum – Principles of angular impulse and angular momentum.

References:

(1) Engineering Mechanics by Singer.
(2) Engineering Mechanics by Timoshenko and D.H. Young.
(3) Engineering Mechanics by J.L. Meriam
(4) Mechanics for Engineers Statics and Dynamics by F.B. Beer and E.R. Johnston
(5) Applied Mechanics by I.B. Prasad.

CE213 MECHANICS OF SOLIDS

Duties / obligations Accountability of structural engineer for the design of a structure : a)economy b)safety: (i) strength consideration (ii) stiffness consideration. Need for assessment of strength of a material – analysis for strength requirement for design purposes – Review of IS code provisions.

Effects of force: tension, compression and shear. Stress as internally elastic resistance of a material – strain – property of elasticity – Hookes law – stress-strain diagrams. Characteristic strengths, Factors of safety and working stresses for materials and various types of application of load. Elastic strain – energy, stress due to gradually applied load, sudden load, impact load and shock load. Lateral strain, Poisson's ratio. Complementary shear stress, shear strain, shear modulus. Relation between modulus of elasticity, modulus of rigidity and bulk modulus. Stresses in composite assemblies due to axial load and temperature change.

Effect of transverse force, Shear force, Bending moment and Axial thrust diagrams for a) Cantilever b) Simply supported and c) Over hanging beams for various patterns of loading. Relation between (i) intensity of loading (ii) Shear force and (iii) Bending moment at a section. Theory of simple bending : flexural normal stress distribution. Flexural shear stress distribution for various shapes of cross section.

(a) Stresses on oblique plane – Resultant stress – Principle stress and maximum shear stress and location of their planes. Mohr's circle for various cases of stresses;
(b)Theory of pure torsion for solid and hollow circular sections – torsional shear stress distribution, effect of combined torsion, bending and axial thrust – equivalent B.M and T.M.
(c) Longitudinal and Hoop stresses in thin cylinders subjected to internal pressure. Wire wound thin cylinders.

(a) Columns and Struts : Combined bending and direct stresses – kern of a section – Euler's theory – end conditions. Rankine – Gordon formula – other empirical formulae – Eccentrically loaded columns – Perry's formula, Secant formula.
(b) Open and closed coiled helical springs subjected to axial load. Thick cylinders –lamme's theory, Compound tubes – Theory of failure (i) Principal Stress theory, (ii) Principal Strain theory, (iii) Maximum Shear Stress theory and (iv) Maximum strain energy theory.

Graphic Statics a) Determination of Resultants of Systems of Coplanar Forces ; b) Locating Centroids of Sections of various Shapes ; c) S.F. & B.M. Diagrams for (i) Cantilever, (ii) Simple Supports, (iii) Over – hanging Beams; d) Determination of Forces in Members of Trusses (having 9 members or less) by Maxwell Diagram

References:

(1) Elements of strength of materials by Timoshenko and Young.
(2) Introduction to mechanics of solids by Popov.
(3) Structural Analysis by Pundit & Gupta
(4) Strength of materials by Hyder.
(5) Elementary mechanics of solids by P.N. Singer and P.K. Jha.
(6) Strength of materials by Ramamrutham.
(7) Strength of materials by Vazirani and Ratwani.

CE 214 BUILDING MATERIALS AND BUILDING CONSTRUCTION

BUILDING STONES

Stones: Classification of rocks basing on geological, physical and chemical etc. composition, characteristics and use of various stones available in India. Stone quarrying Methods, precautions to be taken in various explosives uses, Methods of dressing and Polishing of stones. Various tests on stones as per I.S. code, Natural Bed of stone and its importance in construction. Artificial stones – Varieties.

BRICKS AND CLAY PRODUCTS

Bricks: Sources and qualities of Brick Earth, Classification of Bricks, Manufacture of Bricks, including burning types, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses.

Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

WOOD, WOOD BASED PRODUCTS:

Wood: Classification of various trees, cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, felling and conversion, various Mechanical Properties of timber, Decay of timber, preservation methods, common Indian trees and their uses.

Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

PAINTS, VARNISHES, ASBESTOS, ASPHALT, BITUMEN, TAR:

Paints and Varnishes: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents of varnishes, uses of varnishes, different kinds of varnish, polishes, Lacquer etc.,

Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnishes wood work finishing types.

ASBESTOS & ASPHALT BITUMEN & TAR

Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

Foundations : Different types of soils, Types of Foundations : Strip, Isolated, Strap, Combined Footings, Raft – Mat – Slab and Beam Raft, Box Type Raft, inverted arch foundations, SHELL foundations, Grillage foundations, Different type of pile foundations and their brief description with usual dimensions. Under reamed piles – Minimum depth of Foundation – Bearing capacity of soils

Masonry : Different types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, elevation and Section of Brick Bonds upto Two Brickwall thickness – Partition walls – Different types, Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

CEMENTS, MODERN RENOVATION MATERIALS:

Cements: Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysis of OPC, various field and Lab. Tests on OPC as per IS code. Storing of cement in the field and godowns

Modern renovation materials: Cement bound, polymer cement bound and pure polymer bound materials, their properties & uses.

CONCRETE TECHNOLOGY AND MIX DESIGN,

Polymer Concrete, Types of cement concretes, ingredients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & Transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and its uses.

Roofing: Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminium G.I. Sheet roofings.
Trusses: King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details.

Wooden Doors and Windows: – Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminum, PVC, Steel doors, windows and ventilators, various types of windows, Glazing – different varieties.
Stair Cases: Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

References:

1. "Civil Engg. Materials", by Technical Teachers' Training Institute, Chandigarh, Tata-Mc Graw-Hill Publishing Company Ltd., New Delhi.
2. "Materials of construction", by R.C. Smith, McGraw-Hill Company, New York.
3. "Engineering Materials", 5th edition, By Surindra Singh,, Konark Publishers Pvt. Ltd., New Delhi.
4. "Materials of construction", by D.N. Ghose, Tata-McGraw-Hill Publishing Company Limited..
5. "Engineering Materials", By Sushil Kumar, Metropolitan Book Co., Private Ltd., New Delhi.
6. "Engineering Materials" [Material Science], by Rangwala 'Charotar Publications'
7. "Concrete Technology Theory & Practice" by M.S. Shetty, 'S. Chand & Company Ltd.'
8. "Building Construction" Vol.II & III By W.B. Mckay, E.L.B.S. and Longman, London, U.K.
9. Building Materials by S.K. Duggal New Age International Publishers.
10. Building Construction by B.C. Punmia. Laxmi Publications.
11. Construction Technology by R. Chudly Vols I & II 2nd Edition Longman, UK.

CE215 SURVEYING – I

Introduction: Classification and principles of surveying. Triangulation and Trilateration Earth as spheroid, datum, geoid, Azimuth, latitude, longitude, Map projections, scales, plans, & Maps.
Chain surveying: Instrumentation for chaining – Errors due to incorrect chain-Chaining on uneven and sloping ground-Errors in chaining-Tape corrections – Problems: Base line measurement-chain Triangulation-Check lines, Tie lines, Offsets. Basic problems in chaining-obstacles in chaining-Problems-Conventional signs.

Compass Survey: (a) Introduction to compass survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic bearing – Arbitrary Meridian, R.B & B.B of lines – Designation of bearing – W.C.B. & R.B. – Conversion of bearings – from one systems to the other Related problems – Calculation of angles for bearings, Calculation of bearings for angles, Related problems – Theory of Magnetic compass (i.e. Prismatic compass) – Magnetic dip-Description of Prismatic compass. Temporary adjustments of compass-Magnetic Declination – Local attraction-Related problems –Errors in compass survey.
(b) Traverse Surveying: Chain and compass traversing-Free or loose needle method – Fast needle method-Checks in closed and open traverse-Plotting methods of traverse Survey-Closing error-Balancing the traverse-Bowditch's method-Transit method, gale's Traverse table.

Plane table surveying: Introduction-Advantages, Accessories-Working operations such as fixing the table to tripod, leveling-centering-orientation by back-sighting. Methods of plane tabling-Plane table traversing-Three point problem- Mechanical method – Graphical method- Two point problem-Errors in plane tabling.

Levelling: Definitions of terms-Methods of levelling-Uses and adjustments of dumpy level-Temporary and permanent adjustments of dumpy level levelling staves-Differential levelling, Profile levelling-Cross sections-Reciprocal levelling. Precise levelling-Definition of BS, IS, FS, HI, TP-Booking and reduction of levels, H.I. methods-Rise and fall method-Checks-Related problems-Curvature and refraction Related Problems-Correction-Reciprocal levelling-Related problems-L.S & C.S Leveling-Problems in levelling-Errors in levelling.

Minor instruments: Uses and adjustments of the following minor instruments:
Line Ranger, Optical Square, Abney level, and Clinometer, Ceylon Ghat tracer, Pentagraph, Sextant and Planimeter.
Contouring: Definitions-Interval, Characteristics of contours-methods of locating contours-Direct and indirect methods-interpolation of contours-Contour gradient-Uses of contour maps. Contours mapping using computer techniques (surfer, CAD)

References:

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol. 1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1 and 2 – By S.K. Duggal, Tata Mc.Graw Hill Publishing Co.
4. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail

CE216 ENGINEERING GEOLOGY

General Geology: Importance of geology from civil engineering point of view. Branches of geology. Weathering and soils: Soil profile, Erosion and soil formation, types of Indian soils. Land forms produced by, running water, and glaciers. Land forms produced by wind, sea waves and currents. Ground water: origin, groundwater table, porosity and permeability. Aquifers and groundwater moment and water bearing properties of rocks.

Petrology&Minorlorgy
Petrology: Definition of rock and rock formation. Rocks- classification, Structure, texture and mineralogical composition. Types of rocks-Ingenious rocks: Granite, synite, dolerite, gabro, diorite, basalt. Sedimentary rocks, dykes and sills: Breccia, conglomerate, Sandstone, Shale, limestone. Metamorphic rocks: Gneiss, khondalite, schist, slate, marble, quartzite, charnokite. Engineering properties of rocks. Weathering of rocks.

Mineralogy: physical properties: form, color, luster, cleavage, fracture, hardness and specific gravity. Study of important rock forming minerals: Silicate sturcutres, Quartz, feldspars, pyroxenes, amphiboles, micas and clays.

Statigraphy & Structural geology
Statigraphy: Time scale, Major geological formations of India. Achaeans, Cuddapahs, Vindyans, Gondwanas and Deccan Traps. Mineral resources of Andhra Pradesh.

Structural geology: Elements of structural geology- Strike, dip, plunge. Clinometer compass and Brunton Compass. Classification of folds, faults and joints. Geological methods of Investigations: Geological formations, preparation of geological maps, structural features and groundwater parameters. Natural Hazards: Earthquakes origin and distribution. Volcanoes, Landslides and mass moment. Tsunamis.

Remote sensing and Geophysical methods
Remote sensing: Introduction, electromagnetic spectrum, aerial photo, types of aerial photos and flight planning. Aerial mosaics. Elements of photo interpretation. Satellite remote sensing. Satellites, sensors and data products. Principles of GIS. RS and GIS applications to Civil Engineering -Town planning, dams and reservoirs, linear structures and environmental monitoring.

Geophysical methods: principles of geophysical methods, electrical, Seismic, Gravity and magnetic. Principle of Resistivity method and configurations. Applications of Resistivity method in prediction of soil profile, hard rock and ground water table. Principles of Seismic refraction and reflections methods and their applications to Civil Engineering problems. Geological applications to Civil Engineering Structures**.**

Role of engineering geologist in planning, design and construction stages in Civil Engineering works. Geological investigations for dams and reservoirs. Geological investigations for bridges and Multi- storied structures. Geological investigations for highways, air fields and railway lines. Geological investigations for tunnels and coastal structures(Seawalls, groins an bulkheads). Environmental geology.

References:

1. Principles of Engineering Geology by KVGK Gokhale. B.s.Publications-2005
2. Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd. 2005
3. A. txt book of Gelogy – Mukherjee.
4. Engineering and general geology by Parbin Singh – Katson Publishing house
5. Fundamentals of Remote sensing by George Josesph. University Press (India) Private limited.
6. Engineering Geology by K.M.Bangaru

CE217 STRENGTH OF MATERIALS LABORATORY

(1) Tension test on Mild/HYSD bars
(2) Compression test on wood (parallel and perpendicular to grains)
(3) Tests on springs for the determination of rigidity modulus and spring constant
(4) Brinell's and Rockwell hardness tests.
(5) Charpy and Izod impact tests.
(6) Double shear test on mild steel specimen.
(7) Bending test.: Load deflection test for the determination of young's modulus on simply supported and cantilever beam for wood and steel.
(8) Study of forces in coplanar force system.

CE218 SURVEYING FIELD WORK – I

Chain Surveying: Introduction of instruments used for chain survey, Folding and unfolding of chain-Line ranging (direct method)-Pacing. Chain traversing –Preparation of plan of a residential building by making use of chain, ranging rods, by oblique off-set method, introduction of check line. Preparation of residential building by perpendicular offset, introduction of tie lines. Finding the distance between inaccessible points by making use of chain, cross staff, tape, ranging rods; Arrows and field problems of obstacles to chaining.

Compass Survey: Introduction to prismatic compass-Temporary adjustments. Finding the distance between inaccessible points by making use of compass, tape and ranging rods. Compass traversing-plotting of a residential building.

Plane Table Survey: Introduction to plane table-Use of its accessories: Two & Three Point Problem. Finding the distance between inaccessible points by making use of plane table, its accessories-Ranging rods and tape.

Levelling : Introduction to dumpy level, levelling staff. Reading of level staff, temporary adjustments of dumpy level. Introduction to fly levelling-Booking the readings by height of collimation method. Introduction to fly levelling-Booking the readings by rise and fall method-To find closing error. Check levelling.- L.S. & C.S. of a road profile.

Preparation of contour plan for an open area by taking level of the site.
Field work examination, for sessional marks.

II / IV B.E. (CIVIL ENGINEERING)
&
II / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

2nd Semester:

Code	Title of Course	L	T	P	Total	Univ. Exam.		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE221	Engineering Mathematics-IV	4			4	3	70	30	100	4
CE222	Structural Analysis-I	4	2		6	3	70	30	100	4
CE223	Fluid Mechanics-I	4	2		6	3	70	30	100	4
CE224	Surveying-II	4	1		5	3	70	30	100	4
CE225	Building Planning & Design	3		3	6	3	70	30	100	4
CE226	Environmental Studies	4			4	3	70	30	100	2
CE229	Human Values & Professional Ethics	2			2			100	100	2
CE227	Survey Field Work-II			3	3	3	50	50	100	2
CE228	Fluid Mechanics Lab. – I			3	3	3	50	50	100	2
		23	**5**	**9**	**37**		**520**	**280**	**800**	**26**

II / IV B.E. (CIVIL ENGINEERING)
&
II / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

2 nd SEMESTER

CE221 ENGINEERING MATHEMATICS – IV

FUNCTIONS OF A COMPLEX VARIABLE : Continuity concept of f(z), derivative of f(z), Cauchy-Riemann Equations, Analytic funtions, Harmonic Functions, Orthogonal System, applications to flow problems, integration of complex functions, Cauchy's theorem, Cauchy's integral formula, statements of Taylor's and Laurent's series without proofs, singular points, residues and residue theorem, calculation of residues, evaluation of real definite integrals, geometric representation of f(z), conformal transformation, some standard transformations: (1)w = z+c, (2) w=1/z, w=(az+b)/(cz+d), $w=z^2$, and $w=e^z$.

STATISTICS : Review of probability distributions(not to be examined).
Sampling Theory: Sampling distribution, standard error, Testing of hypothesis, Level of significance, Confidence limits, Simple sampling of attributes, sampling of variables-large samples, and small samples, Student's t-distribution, χ^2-distribution, F-distribution, Fisher's Z-distribution.

DIFFERENCE EQUATIONS AND Z-TRANSFORMS : Z-transforms, definition, some standard Z-transforms, Linear property, Dampling rule, some standard results, shifting rules, initial and final value theorems, Convolution theorem, Evaluation of inverse transforms, definition, order and solution of a difference equation, Formation of difference equations, Linear difference equation, Formation of difference equations, Linear difference equations, Rules for finding C.F. Rules for finding P.I. Difference equations reducible to linear form, Simultaneous difference equations with constant coefficients, Application to deflection of a loaded string, Application of Z-transform to difference equations.

TEXT BOOK:

Higher Engineering Mathematics (34^{th} edition 1998) by B.S. Grewal.

References:

1. A text book on Engineering Mathematics by N.P. Bali et al.
2. Higher Engineering Mathematics by M.K. Venkataraman.
3. Advanced Mathematics for Engineering Students Vol-2 and Vol-3 by Narayanan et al.
4. Advanced Engineering Mathematics by Erwin Kreyszig.
5. Engineering Mathematics by P.P. Gupta.
6. Advanced Engineering Mathematics by V.P. Jaggi & A.B. Majumdar.
7. Engineering Mathematics by S.S. Sastry
8. Advanced Engineering Mathematics by H.K. Dass
9. Engineering Mathematics Vol-2 by Terit Majumdar.

CE222 STRUCTURAL ANALYSIS – I

Deflections of Beams : (i) Cantilever (ii) simply supported and (iii) over hanging beams, using (a) double integration and (b) Macaulay's method. Analysis for forces in members of a truss (having 9 members or less) by tension coefficient method only

Deflections of Statically Determinate Structures: (a)Single storey, single bay rectangular portal frames using (i) Unit load method, (ii) Castigliano's theorm –1. (b) Trusses (having 9 members or less) using (i) Unit load method, (ii) Castigliano's theorem-1. (iii) Williat Mohr Diagram.

Strain – energy due to (i) Axial load, (ii) Shear force, (iii) Bending Moment and (iv) Torque;
Deflections of Beams using (i) Moment area method, (ii) Conjugate beam method, (iii) Unit load method, (iv) Conservation of energy method and (v) Castigliano's theorm – 1.

Analysis of (a) fixed beams, (b) three span continuous beams using (i) Theorm of three moments, (ii) Slope deflection method and (iii) Moment distribution method.

Moving loads: Maximum Shear force and Bending moment diagrams for different types of loads. Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads. Equivalent uniformly distributed live load for Shear force and Bending moment. Reversal of nature of Shear force, focal length, counter bracing for truss panels, Influence lines for (i) Beams and (ii) members of Warren and Pratt trusses.

References:

(1) Structural Analysis By Pundit & Gupta.
(2) Strength of Materials – Ramamrutham.
(3) Elementary strength of materials – Timoshenko and Young.
(4) Strength of materials – Singer.
(5) Strength of materials – Jain and Arya.
(6) Analysis and Design of structures – Vazirani and Ratwani

CE223 FLUID MECHANICS – I

Fluid Properties and Fluid Statics: Introduction & Physical Properties of Fluids – Definition of Fluid, Fluid as Continuum; Mass Density, Specific Weight, Specific Gravity, Specific Volume, Bulk Modulus, Compressibility, Vapour Pressure, Cavitation, Viscosity – Newton's Law of Viscosity, Rheological Diagram ; Capillarity and Surface Tension.
Fluid Statics, Pressure and its measurement – Forces Acting on a Fluid Element – Pascal's law; Variation of Pressure in Static Fluid; Absolute, Gauge and Total Pressure; Pressure Measurement – Piezometers, Manometers, Micro-manometers, Mechanical Gauges and Pressure Transducers.
Forces on Immersed Bodies in Static Fluids – Force on a Plane Surface – Centre of Pressure; Pressure Diagram; Forces on Curved Surfaces; Forces on radial Crest Gates and Lock Gates.
Buoyancy & Floatation – Archimedes Principle; Stability of Floating Bodies – Centre of Buoyancy, Metacentric Height and its Determination.
Liquids in Relative Motion – Pressure of Liquids in a Container Subjected to Linear Acceleration and Rotation.
Fluid Kinematics and Conservation of Mass: Types of Fluid Flow & Methods of Fluid Flow Analysis – Methods of Describing Fluid Motion; Types of Flow – Steady & Unsteady Flows, Uniform & Non-uniform Flows, free and forced vortex motions, Laminar & Turbulent Flows; Streamline, Path line, Streak line; Stream Surface – Stream Tube.
Fluid Kinematics – Translation, Deformation and Rotation of a Fluid Element in Motion; Local, Convective and Total Accelerations; One, Two & Three Dimensional Analysis of Flows.
Ideal Fluid Flow – Stream Function, Velocity Potential; Rotational & Irrotational Flows – Vorticity & Circulation; Laplace Equation in terms of Stream Function and Velocity Potential; Flow Nets.
Principle of Conservation of Mass – Concepts of System and Control Volume; Continuity Equation in three dimensional Cartesian coordinates; Continuity Equation for flow through a Stream tube.

Fluid Dynamics: Principle of Conservation of Energy – Equation of Motion for Ideal Fluids, Euler's Equation in Streamline Coordinates, Derivation of Energy Equation through integration of Euler's Equation, Bernoulli's Equation, Energy Correction Factor. Flow measuring devices – Flow Measurement in Pipes – Measurement of Static, Stagnation and Dynamic Pressures and Velocity – Pitot Tube, Prandtl Pitot Tube; Measurement of Discharge through a Pipe using Flow Meters – Venturimeter, Flow Nozzle meter and Orifice meter.
Flow through Tanks and Reservoirs – Measurement of Discharge from Tanks and Reservoirs – Steady and Unsteady Flow through Orifices and Mouthpieces – Small & Large Orifices – Different types of Mouthpieces; Discharge from tanks through Drowned Orifices, Time of Emptying Tanks, Discharge from a Tank with Inflow.
Flow Measurement in Channels – Flow Measurement in Open Channels, Flow Past Weirs and Notches, Sharp Crested and Broad Crested Weirs, Weirs with and without end contractions, Ventilation of Weirs, Triangular Notches, Cipolletti Weir.

Principle of Conservation of Momentum – Momentum of Fluids in Motion, Impulse Momentum Equation, Momentum Correction Factor. Application of Momentum Principle – Forces on Pipe Bends and Reducers, Flow through a Nozzle; Angular Momentum of fluid flow – Sprinkler Problems.

Flow through Pipes: Introduction to Pipe Flow and Laws of Friction – Reynolds Experiment; Steady Turbulent Flow through Pipes; Laws of Friction; Darcy-Weisbach Equation.
Total Energy and Hydraulic Gradient – Energy and Hydraulic Gradient Lines; Minor Losses in Pipes; Pipes in Series and Parallel – Equivalent Length of Pipe.
Flow between Two reservoirs; Three Reservoir Problems; Distribution Mains; Working Pressures, Design Pressure and Test Procedures; Choice of Pipe Material; Siphon; Pipe Network Analysis by Hardy-Cross Method; Hydraulic Power Transmission through Pipes and Nozzles, Water hammer (only concept).

Laminar flow: Equation of Motion for Real Fluids – Modifications in Equation of Motion, Stress Strain Relationships, Tangential Stress Terms.
Plane Two- dimensional Flows – Steady Flow between Parallel Plates, Couette and Poiseuille Flows; Axisymmetric Flows – Flow through a Circular Annulus, Flow without and with Pressure Gradient – Hagen-Poiseuille Equation; Relationship between Friction factor and Reynolds Number for Laminar Flow through Pipes; Stokes' law.

References:

1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.

3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
4. Engineering Hydraulics, Rouse, H., John Wiley & Sons Inc.
5. Mechanics of Fluids, Shames, I.H., McGraw-Hill Professional.

CE224 SURVEYING – II

Theodolite-Types of theodolites – Temporary Adjustments, Measurements of horizontal angle – Method of repetition, Method of reiteration – Uses of theodolites – Errors in theodolite or Permanent adjustments of a theodolite – Identification – Rectifying the errors. Theodolite traversing – Open and closed traverse – Closing errors, Balancing the error – Bowditch method – Transit method, Omitted measurements – gales traverse table or Trigonometric leveling – Elevation of top of the tower – same plane – Different planes – Axis signal correction.

Tacheometry – Principle of tachometry – Stadia methods – Fixed hair method – Movable hair method – Tangential method – Subtanse bar – Beaman's stadia, Arc – Reduction diagrams or Triangulation – Classification-intervisibility of station- Signals and towers-base line measurements – Corrections – Satellite station and Reduction to centre – Basenet.

Curves – Sample curves – Elements of simple curves – Methods of setting simple curves – Rankines method – Two theodolite method – Obstacles in curve setting – Compound curves – Elements of compound curves or Reverse curves – Elements of reverse curve – Determination of various elements – Transition curves – Ideal shape – Spiral transition curves – length of transition curve – Setting out methods.

Total Station Surveying: Electronic Theodolite, Electronic Distance Measurements, Total Station, Errors in measurements, Advantages, Disadvantages, Applications; Contour mapping, determination of height of remote point, position of hidden point, free station, Area measurement, volume measurement.

Modern surveying and mapping: GPS survey's – Introduction, Errors in GPS, Positioning methods, classification of GPS surveying, applications, advantages and disadvantages, photogrammetric surveying; sensors & platforms, aerial photogrammetry, Satellite images resolution, concept of stereo models, photogrammetric products, rectified images, orthophotography, topographic map, digital maps, DEM, GIS, Advantages & Disadvantages of photogrammetric surveying.

References:

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol. 1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1 and 2 – By S.K. Duggal, Tata Mc.Graw Hill Publishing Co.
4. Principles of GIS for land resource assessment by P.A. Burrough – Clerendon Press, Oxford.
5. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail

CE225 BUILDING PLANNING AND DESIGN

Residential Buildings : Different types of Residential Buildings Selection of Site for Residential Building. Brief Information of Housing Colonies for Different Income Groups in India-Sizes of Plots - Public Spaces, Evolutionary Housing Concept.

Climatology: Elements of Climate : Sun, Wind, Relative Humidity, Temperature effects, Comfort Conditions for House, various types of Macro Climatic Zones. Design of Houses and Layouts with Reference to Climatic Conditions. Orientation of Buildings. Solar Charts, Ventilation. Principles of Planning Anthropometric Data

Preliminery Drawings : (a) Conventional signs of materials various equipment used in a Residential Building (copying exercise) (b) Plan section and Elevation of a small House (one room and varandah) (copying exercise) (c) Plan section and Elevation of Two Bed Room House (copying exercise) (d) (e) (f) Plan section and Elevation of three bed room house in Hot and Humid zone, Hot and Arid zone, cold zone (copying exercises)

(a) Design of Individual rooms with particular attention to functional and furniture requirements. Building regulations and Byelaws of Residential Buildings;
(b) Auto Cad drawing of residential building (only for internal assessment)

Drawing the Plan Section and Elevation of Houses with given Functional requirements and climatic data. (Emphasis may be given to Hot and Humid zones.)

References:

1. Building Planning and Drawing by Dr.N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors.
3. Civil Engineering Drawing Series ‘B’ by R.Trimurty, M/S Premier Publishing House.
4. Building Drawing with an integrated approach to Built environment by M.G.Shah, C.M.Kale and S.Y.Patki, McGraw-Hill Publishing Company Limited, New Delhi.

CE226 ENVIRONMENTAL STUDIES (COMMON TO ALL BRANCHES)

Introduction: Definition, scope and importance. Measuring and defining environmental development; indicators.

Ecosystems : Introduction, types, characteristic features, structure and functions of ecosystems like Forest, Grass Land, Desert ,Aquatic (Lake, rivers and estuaries)

Environmental and Natural Resources Management.
Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems.
Forest resources: Use and over-exploitation, Mining and dams – their effects on forest and tribal people.
Water resources: Use and over- utilization of surface and groundwater, Floods, droughts.Water logging and salinity.Dams –benefits and costs.Conflicts over Water.Energy resources
Energy resources: Energy needs. Renewable and non renewable energy sources. Use of alternative energy sources. Impact of energy use on environment

Value of bio-diversity -consumptive and productive use, social, ethical, aesthetic and option values.
Bio-geographical classification of India – India as a mega diversity habitat.
Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – Insitu and Ex-situ conservation.

Environmental Pollution –Local and Global Issues. Causes, effects and control measures. Air pollution. Indoor air pollution. Water pollution. Soil pollution. Marine pollution. Noise pollution. Solid waste management, composting, vermiculture. Urban and industrial waste, recycling and re-use. Nature of thermal pollution and nuclear hazards. Global warming. Acid rain. Ozone depletion.

Environmental Problems in India. Drinking water, sanitation and public health. Effects of the activities on the quality of environment. Urbanization. Transportation. Industrialization. Green revolution. Water scarcity and groundwater depletion. Controversies on major dams – resettlement and rehabilitation of people: problems and concerns. Rain water harvesting, cloud seeding and watershed management.

Economy and Environment. The economy and environment interaction. Economics of development, preservation and conservation. Sustainability: theory and practices. Limits to growth. Equitable use of resources for sustainable life styles. Environmental Impact Assessment.

Special issues and Environment. Population growth and environment. Environmental education. Environmental movements. Environment vs. Development.

Institutions and Governance. Regulation by Government. Monitoring and enforcement of Environmental regulation. Environmental acts. Water (Prevention and control of pollution) act. Air (Prevention and control of pollution) act. Environmental Protection act. Wild life Protection act. Forest conservation act. Coastal zone regulations. Institutions and policies relating to India. Environmental Governance.

International conventions. Stockholm Conference 1972. Earth Summit 1992. World Commission for Environmental Development (WCED)

Case Studies : Chipko movement,Narmada Bachav Andolan,Silent Valley Project,Madhura Refinery and Taj Mahal,Industrialisation of Patancheru,Nuclear reactor at Nagarjuna Sagar,Tehri dam,Ralegaon Siddhi (Anna Hazare),Kolleru lake. –aquaculture,Florosis in Andhra Pradesh.

Field work: Visit to a local area to document and mapping environmental assets –river / forest / grass land / hill / mountain. Study of local environment- common plants, insects, birds. Study of simple ecosystems –pond, river, hill, slopes etc. Visits to industries, water treatment plants, affluent treatment plants.

CE229 HUMAN VALUES & PROFESSIONAL ETHICS

No of Periods per Week : 2 L+ 0 T Credits: 2 Sessional Marks:100

UNIT-I: Ethical Theories

- Basic Moral Theories:
  i) Beneficence: doing good to others
  ii) Non-violence or peace
  iii) Justice

UNIT-II

- Classification of Ethical Theories:
  i) Consequentialism–Mill's utilitarianism- greatest happiness to greatest number of people.
  ii) Deontology-Kantianism-Actions must satisfy the categorical imperative.
  iii) Virtue theory-Aristotelianism virtue is a mean between two extremes of action or passion.

UNIT-III

- Rights & Responsibilities of a citizen:
  i) Fundamental duties as stipulated in the constitution of India.
  ii) The rights to individuals guaranteed by Indian constitution.
  iii) (a) Rights of a professional
  (b) Professional responsibilities.

UNIT-IV

- Human Values & Attitudes:
  i) Classification of Values
  ii) Analysis of desirable values
  iii) The importance of attitudes in personal & Professional lives.

UNIT-V

- Ethical Living:
  i) Maslow's theory of Hierarchy of needs.
  ii) Clayton Alderfer's ERG (Existence, Relatedness and Growth) theory.
  iii) Concept of harmony in life.

Reference Book: Subramanian R. 2013, Professional Ethics, New Delhi: Oxford

CE227 SURVEYING FIELD WORK – II

1. Measurement of Horizontal Angles by Repetition & Reiteration, Measurement of Vertical Angles, Heights & Distances
2. Distance between two in-accessible points by theodolite
3. Tachometry
4. Setting out curve by deflection angle method by two theodolites
5. Point positioning using GPS
6. Contour mapping using total station
7. Height of remote point using total station
8. Position of hidden point using total station
9. Area & volume measurement using total station

CE228 FLUID MECHANICS LABORATORY – I

1. Study of Small orifice, by constant head method and Time of emptying a tank through a small orifice.
2. Study of Cylindrical mouthpiece by constant head method and Time of emptying a tank through a cylindrical mouthpiece.
3. Study of floating body and determination of Metacentric Height.
4. Study of surface profiles in Free and Forced Vortex motions.
5. Study of Venturimeter.
6. Study of Orifice meter.
7. Study of Flow nozzle meter.
8. Study of Sharp – crested full width and contracted weirs.
9. Study of V-notch and Trapezoidal notch.
10. Study of Broad-crested weir.

III / IV B.E. (CIVIL ENGINEERING)
&
III / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

1st Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE311	Reinforced Concrete Structures – I	4	1		5	3	70	30	100	4
CE312	Steel Structures – I	4	1		5	3	70	30	100	4
CE313	Fluid Mechanics – II	4	1		5	3	70	30	100	4
CE314	Geotechnical Engineering- I	4	1		5	3	70	30	100	4
CE315	Environmental Engineering- I	4			4	3	70	30	100	4
CE316	Estimating and Quantity Surveying	4	2		6	3	70	30	100	4
CE317	Environmental Engg. Lab			3	3	3	50	50	100	2
CE318	Geotechnical Engg. Lab-I			3	3	3	50	50	100	2
CE319	Soft Skills			2	2			100	100	1
FE 01	Free Elective -I	4	-	-	4	3	70	30	100	4
		28	**6**	**8**	**42**		**590**	**410**	**1000**	**33**

FREE ELECTIVE – I.

III / IV B.E. (CIVIL ENGINEERING)
&
III / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

1 st SEMESTER

CE311 REINFORCED CONCRETE STRUCTURES – I

General : Loading standards as per IS 875, Grades of steel and cement, Stress-Strain characteristics of concrete and steel, Introduction to working stress method and Limit State Method (L.S.D.) of design.
Limit State of Collapse of in Flexure : Central Value measures, Measures of distribution, Normal distribution curve. Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

Limit State of Collapse: Flexure of R.C.C. beams of rectangular section. Under reinforced, Balanced and over reinforced sections. Compression stress block, Estimation of ultimate moment by strain compatibility. Guide lines for choosing width, depth and percentage of reinforcements in beams.
Analysis and design of singly reinforced rectangular beams and doubly reinforced beams, design by using SP 16 (Sessional Work Only).
Design of flanged beams (T and L), Effective flange width, Basis of analysis and design, Minimum and Maximum steel in flanged beams, SP 24 in design of beams.

Design of one way and two way slab : Simply supported slabs on all four sides, Moment in two way slabs with corners held down. Choosing slab thickness. Design of restrained slabs (with torsion at corners) I.S. code provisions. Detailing of reinforcement. Load from slabs on supporting beams. Different kinds of loads on slabs including partition walls, Shear in slabs.

SHEAR, TORSION AND BOND : Limit state of collapse in shear, types of shear failures. Truss analogy, shear span / depth ratio. Calculation of shear stress, types of shear reinforcement. General procedure for design of beams for shear. Enhanced shear near supports. Shear in slabs, steel detailing. Analysis for torsional moment in a member. Torsional shear stress in rectangular and flanged sections. Reinforcement for torsion in RC beams. Principles of design for combined bending shear and torsion. Detailing of torsion reinforcement – Concept of bond, development length, anchorage, bond, flexural bond.

Columns : Short and Long columns, Minimum eccentricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial and biaxial moments.

Footings : Analysis and design of isolated Square and rectangular footings.
Design of stair case.

TEXT BOOKS :

1. Limit State of Design of Reinforced Concrete – P. C. Vergheese
2. Reinforced Concrete Limit state Design – A.K. Jain.
3. R.C.C Design – Unnikrishna Pillai and Vasudeva Menon.

References:
Reinforced Concrete Limit state Design, P. Dayaratnam
Reinfoeced Concrete Structures by R Park and Paulay

CE 312 STEEL STRUCTURES – I

Note: All the designs should be taught in the limit state design method as per IS 800-2007

Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel.
Bolted connections: Behavior of bolted joints, Design strength of ordinary black bolts, high strength friction grip bolts, Simple connections, Moment resistant connections.

Welded Connections: Advantages of welding, Types and prosperities of welds, Types of joints, weld specifications Design of welded joints subjected to axial load, Eccentric welded connections.

(a) Tension members: Types of tension members, Design of strands, slenderness ratio, displacement of tension members, behavior of tension members, modes of failure, factors affecting strength of tension members, angles under tension, design of tension members, Lug angles, splices.
(b)Compression members: Possible failure modes, classification of cross-section, behavior of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, built up compression members, Laced and Battened columns, eccentrically loaded columns, Column splices.

(a) Beams: Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, Laterally supported and unsupported beams, Design of built up beams.
(b) Roof trusses: Types of trusses, Economical spacing of roof trusses, loads on roof trusses, Estimation of wind load on roof trusses as per IS : 875. Design of members of roof truss and joints, Design of purlins.

(a): Column bases and Foundations: Allowable stress in bearing, Slab base, Gusset base and Grillage foundations.
(b) Introduction to pre-engineered structures, concepts and advantages, disadvantages.

References:

1. Design of Steel structures by N. Subramanian, Oxford University Press.
2. Limit State Design of steel structures – Ramchandra and Virendra Gehlot, Scientific Publishers (India)
3. Limit State Design of steel structures by S.K.Duggal, McGraw Hill Education Private Ltd.
4. Design of steel structures by K.S.Sai Ram, Pearson Education India.
5. Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.

CE313 - FLUID MECHANICS – II

Viscous Effects on Fluid Motion: Navier-Stokes Equations (No Derivation) – N.S. equations for standard cases of Plane two Dimensional and Axisymmetric Flows.

Boundary Layer Theory: Theory of Boundary Layer – Characteristics of Laminar Boundary Layer – Boundary Layer growth over a Flat Plate (without pressure gradient) – Boundary Layer Thickness and its Characteristics – Displacement, Momentum and Energy Thicknesses; Stability Parameter; Laminar and Turbulent boundary layers.
Boundary Layer Separation – Mechanism of Separation, Control of B.L. Separation; Boundary Layer on rough surfaces - Laminar Sublayer, Shear friction velocity; Friction Drag.

Turbulent Flow: Critical Reynolds Number – Characteristics of Turbulent Flow – Mean and Fluctuating Components of Velocity, Quantitative Description of Turbulence, Statistical Nature of Turbulent Flow, Isotropic and Homogeneous Turbulence.
Analysis of Turbulent Flows – Shear Stress due to turbulence – Semi-empirical Theories, Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept; Velocity distribution for hydrodynamically smooth and rough pipes; Variation of Friction Factor in turbulent flow; Friction Factor for commercial pipes – Moody diagram.

Drag, Lift & Propulsion: Concepts of Drag and Pressure Distribution over Immersed Bodies – Drag and Lift – Deformation Drag, Friction Drag, Form Drag – Drag coefficient.
Distribution of Fluid Pressure on immersed bodies – Pressure Distribution for flow past a circular disk, sphere; Effects of eddy pattern in two dimensional flow –Distribution of pressure for two dimensional flow past a cylinder – von Kármán vortex trail, Eddy shedding; Drag of immersed bodies – Variation of Drag Coefficient with Reynolds Number – Drag on Cylinder –Resistance diagram for bodies of revolution; Drag Coefficient of Practical Bodies.
Lift & Propulsion – Effect of Circulation in Irrotational Flow, Generation of Lift around a Cylinder, Magnus Effect, Computation of Lift Force; Lift on Airfoil – Lift Coefficient and its Variation with Angle of Attack, Joukowsky Profile, Polar Diagram, Stall; Induced Drag.

Open Channel Flows: Basic Concepts – Introduction, Classification of Open Channels – Classification of Flow; Channel Geometry – Geometric Elements of a Channel Section; Velocity Distribution in a Channel Section; Wide Open Channel; Measurement of Velocity; Velocity Distribution Coefficients; Pressure Distribution in a Channel Section – Effect of Slope on Pressure Distribution; Basic Equations – Chezy's Equation, Manning's Equation.
Uniform Flow Computation; Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow; Determination of Normal Depth and Velocity; Design of Channels for Uniform Flow; Design of Non-erodible Channels; Best Hydraulic Section; Determination of Section Dimensions for Uniform Flow; Most Economical Channel Sections – Rectangular, Trapezoidal, Circular and Triangular Channel Sections; Critical Flow – Computation of Critical Flow, Section Factor for Critical Flow.
Application of Energy Principle in Open channels – Definition of Specific Energy, Specific Energy Diagram, Critical depth, Critical Velocity, Conjugate or Alternate Depths, Sub-critical, Critical and Super-critical Flows, Froude Number, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections; Application of Momentum Principle in Open channels – Specific Force; Canal Transitions – Change of Depth in Channels with Change in Cross-section and Hump in the Bed; Control Sections; Venturi Flume and Parshall Flume.
Varied Flow in Open Channels: Analysis & computation of G.V.F: Definition of G.V.F. and Derivation of Governing Equation – Mild, Steep, Critical, Horizontal and Adverse Slopes – Backwater and Drawdown Curves – G.V.F. Profiles for Channels with Changing Slopes; Computation of G.V.F. Profiles – Method of Direct Integration (Procedures Only), Direct Step Method – Computation of G.V.F. Profiles in rectangular channels using Direct and Single Step methods (Simple Slope cases only).
Rapidly Varied Flow – Hydraulic jump, Types of jump, Hydraulic jump in horizontal rectangular Channels; Surges.

References:

1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.
3. Engineering Fluid Mechanics, Kumar, K.L., S. Chand & Co. Ltd.

4. Flow in Open Channels, Subramanya, K., Tata McGraw-Hill Publishing Co. Ltd.
5. Flow through Open Channels, Ranga Raju, K.G., Tata McGraw-Hill Publishing Co. Ltd.
6. Open Channel Hydraulics, Chow, V.T.,McGraw-Hill Ltd.

CE314 GEOTECHNICAL ENGINEERING – I

A) Introduction: Historical development – Physical properties of Soil – Void ratio – Porosity, Degree of Saturation, Water content, Unit Weights, Specific Gravity – their relationships, Relative density. Consistency limits – determination and various indices – plasticity index Liquidity index – Significance and Importance, Activity.
Classifications : Mechanical analysis – Sieve analysis, stoke's law, hydrometer and Pipette Analysis Textural Classification, Structural Classification based on size – unified soil classification and modification by Bureau of Indian Standard.
B). Soil Hydraulics – Types of soil water capillary rise and surface tension, Darcy's law and its limitations constant head and variable head permeameters pumping tests, Factors effecting coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, No flow downward flow and upward flow conditions, quick sand conditions, critical hydraulics gradient.
Stress distribution : Bousinesq's theory for determination of vertical stress, assumptions and validity, extension to rectangular and circular loaded areas, 2 : 1 approximate method, westergard's theory Newmarks influence chart. Construction and use, contact pressure distribution beneath footings.
Consolidation : Oedometer Test, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi's one dimensional consolidation theory assumption, derivation and application, coefficient of consolidation time curve fitting methods, initial compression, primary compression and secondary compression determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

Compaction : Mechanism of compaction Factors effecting compaction – water content, compactive effort, Nature of soil. B.S., Modified AASHO and IS compaction tests. Effect of compaction on physical and engineering properties of soils, Field compaction – Equipment and Quality Control proctors penetrometer.
Subsoil Exploration : Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.
Shear Strength of Soils : Stress at a point, Mohr circle of stress, Mohr coulomb failure theory shear tests – shear box, unconfined compression, and triaxial compression tests, fieldvane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio and dilatancy, shear strength of clays, total stress analysis and effective stress analysis, skemptons pore pressure coefficients, stress paths.

References :

1. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao.
2. Soil Mechanics, Foundation Engineering by V.N.S. Murthy.
3. Soil Mechanics and Foundation Engineering by K.R. Arora

CE315 ENVIRONMENTAL ENGINEERING – I

Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

Water Demand and Quantity studies : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

Hydrological Concepts: Hydrological Cycle, Types of Precipitation, Measurement of Rainfall. Surface sources of water: Lakes, Rivers, Impounding Reservoirs, Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, Springs, Wells and Infiltration galleries, Yields from wells and infiltration galleries.

Collection of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water : Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Laying of pipe lines.

Quality and Analysis of Water: Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

Treatment of Water : Flowchart of water treatment plant, Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, Defluoridation, Removal of Odours.

Distribution of Water: Methods of Distribution system, Components of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks, Water connection to the houses.

References:

1. Environmental Engineering – Peavy, Rowe, Tchenobolus
2. Elements of Environmental Engineering – K.N. Duggal
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S.Birdie
4. Water Supply Engineering – Dr. P.N.Modi
5. Water Supply and Wastewater Engineering – Dr. B.S.N.Raju
6. Water Supply Engineering – B.C. Punmia
7. Water Supply Engineering – Hussain
8. Water Supply Engineering – Chatterjee

CE316 ESTIMATING AND QUANTITY SURVEYING

Introduction : Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

Specialisations : Meaning, purpose, types of specialisations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Race analysis – Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

Detailed estimate of buildings. Different items of work in building; Principles of taking out quantities, detailed measurement form; long walls and shortwalls method of building estimate, Centre line method of building estimate. Estimate of RCC building, slope roof buildings; G.I. and A.C. Sheet, Detailed estimate of different types of doors and windows, electricity and water supply. Sanitation works etc.

Estimate of earth work; different formulae for calculations, estimate of metalled road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc. Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning.

References:

1. Estimation, Costing, Specifications and Valuation in civil Engineering by M.Chakraborti.
2. Estimating and Costing in Civil Engineering by B.N. dutta.
3. Textbook of estimating and costing by G.S. Birdie.
4. Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli.

CE317 ENVIRONMENTAL ENGINEERING LABORATORY-1

1. (a) p^H.
   (b) Conductivity.
2. (a) Turbidity.
   (b) Jar Test .
3. Hardness.
4. Acidity estimation.
5. Alkalinity estimation.
6. Available Chlorine & Residual Chlorine.
7. Fluorides.
8. Iron Estimation.
9. Estimation of Total Solids : Settleable Solids : Suspended solids, dissolved solids.
10. D.O.
11. B. O. D.
12. C. O. D.
13. Chlorides.

CE318 GEOTECHNICAL ENGINEERING LABORATORY – I

1. Atterberg limits
2. Field density by Core Cutter and Sand replacement method.
3. Grain size analysis
4. Hydrometer/pipette analysis.
5. Specific gravity by pycnometer/density bottle method.
6. Permeability of soil – Constant and variable head tests.
7. IS light compaction.

DEMONSTRATION EXPERIMENTS:

1. Consolidation test.
2. Quick sand model and others if any.

CE319 SOFT SKILLS

(COMMON WITH OTHER BRANCHES)

Communication:

Importance of communication
Non verbal communication
Personal appearance Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:

Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:

Types of time
Identifying time wasters
Time management skills

Leadership and team management:

Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:

Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, analysing performance

Job interviews:

Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

III / IV B.E. (CIVIL ENGINEERING)
&
III / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

SCHEME OF INSTRUCTION

2nd Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE321	Structural analysis – II	4	2		6	3	70	30	100	4
CE322	Reinforced Concrete Structures – II	4	2		6	3	70	30	100	4
CE323	Steel Structures – II	4	2		6	3	70	30	100	4
CE324	Geotechnical Engineering-II	4	1		5	3	70	30	100	4
CE325	Fluid Mechanics – III	4	2		6	3	70	30	100	4
CE326	Elective -I	4	2		6	3	70	30	100	4
CE327	Geotechnical Engg. Lab. II			3	3	3	50	50	100	2
CE328	Concrete Laboratory			3	3	3	50	50	100	2
	Industrial Training	To be held during summer vacation and evaluated@ in the 1st Semester of IV year								
		24	**11**	**6**	**41**		**520**	**280**	**800**	**28**

@ Assessment as indicated along with the requirements given in the syllabus part.

ELECTIVE – I (COURSE NO. CE 326)

CE326 A Repair and Rehabilitation of structures
CE326 B Remote Sensing and Geographical Information Systems (G.I.S.)

III/ IV B.E. (CIVIL ENGINEERING)
&
III / IV B.E. (CIVIL ENGINEERING with ENVIRONMENTAL ENGINEERING Elective)

2 nd SEMESTER

CE321 STRUCTURAL ANALYSIS – II

Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii)Castigliano's theorm – II.

Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (i)slope-deflection method (ii)moment distribution method (iii)Kani's method, (iv) Column Analogy.

Arches : Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

Suspension bridges : Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.
(a) Analysis of Multistoreyed frames by substitute frame method, Analysis of Multistoreyed frames for wind loads by portal, cantilever and Girder Factor methods.
(b)Introduction to matrix methods of structural analysis (Very elementary treatment only) Static indeterminacy, Kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only. – Truss with 3 supports and 7 members.

References

1. Statically indeterminate structures – C.K. Wang
2. Structural analysis – A matrix approach – G.S. Pandit and S.P. Gupta.
3. Indeterminate Structures by R.l. Jindal
4. Indeterminate Structural Analysis by J.S. Kinney.

CE322 REINFORCED CONCRETE STRUCTURES – II

Retaining Walls : Types of retaining walls, forces on retaining walls, Rankine and Coloumb earth pressure theories (c and ϕ soils). Passive earth pressure, Drainage of retaining walls. Stability requirements. Preliminary proportioning of cantilever retaining walls. Design of cantilever and counterfort retaining walls.

Water Tanks : Stress in concrete and steel in water tanks, Modular ratio, Impermeability requirements, Under ground rectangular tanks, Elevated rectangular and circular tanks, Design of these tanks for strength and cracking, Design of staging of rectangular tanks.

Bridges : Components of a bridge in sub structure and super structure. Classification of bridges. Highway loading standards, kerbs, footpaths, railings, parapet loadings, Impact, wind, longitudinal forces.
Design of solid slabs (casual reference to MOST drawings) Design of T-beam bridge deck slab, Longitudinal and Cross beams (casual reference to MOST drawings) Courbon's theory.

Piles and Pile caps : Design of bored cast in situ piles (bearing and friction types), under reamed piles. Pile Caps design; bending and truss methods.

Prestresed Concrete – Reinforced Concrete Versus Prestressed Concrete. – Prestressing Systems (Fressinet, Gifford Udal, Magnel Blatten) – Prestressing Losses – Steel and Concrete for Prestressing – Homogeneous Beam Concept, limiting eccentricities, Pressure line, Elastic Stress distribution across the depth due to D.L. eccentric prestress and L.L.

References:

1. Limit State of Design of Reinforced Concrete – P.C. Vergheese
2. Reinforced Concrete Limit State Design – A.K. Jain.
3. Design of reinforced Concrete Structures – P. Dayaratnam

CE323 STEEL STRUCTURES – II

Note: All the designs should be taught in the limit state design method as per IS 800-2007".

Plate Girders (Bolted and Welded): Components of a plate girder, Economical depth, proportioning of web and flanges, shear buckling resistance of web (simple post critical and tension field methods), curtailment of flange plates, connection of flange angles to web and flange angles to flange plates.

Web stiffeners: Design of bearing stiffeners. End panel design, design of intermediate stiffeners, connections. Web splices (Rational splices), Splices of flange angles and flange plates.

Bridges: Classification, Loadings, Deck type and through type bridges, Plate girder bridges, design of stringers, cross girders, wind bracings.
Bearings: Types of bearings, plate bearing, Rocker bearing, Roller bearing, Knuckle pin bearing.

Water tanks, Introduction, Design of elevated circular and rectangular water tanks, Design of pressed steel tanks.

Plastic analysis: Introduction, Upper and Lower bound theorems, Uniqueness theorem, Shape factor, Load factor
Beams: Collapse load for fixed and continuous beams, Design of beams
Frames: Collapse load for a frame of single bay single storey frame.

References:

1. Design of Steel structures by N. Subramanian, Oxford University Press.
2. Limit State Design of steel structures – Ramchandra and Virendra Gehlot, Scientific Publishers (India)
3. Limit State Design of steel structures by S.K.Duggal, McGraw HillEducation Private Ltd.
4. Design of steel structures by K.S.Sai Ram, Pearson Education India.
5. Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.

CE324 GEOTECHNICAL ENGINEERING – II

Bearing Capacity : Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, General and local shear failure conditions. Factors affecting bearing capacity of Soil. Allowable bearing pressure based on N-values. Bearing capacity from plate load tests.

Shallow Foundations : Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations. Foundations on expansive soils.
Settlement analysis : causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

Pile Foundations : Types, Construction, load carryig capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

Caissons : Types of caissons, pneumatic caissons, Different shapes of well foundations. Relative advantages and disadvantages. Different Components of well and their function. Grip length, problems in well sinking and remedial measures.

Stability Analysis of Slopes : Finite Slopes Fellinius slip circle method, Friction Slip circle method and Taylor's stability numbers, types of failure of finite slopes – Toe slope and Base failure. Infinite slope, factors of safety.

Earth Pressure : Types of Earth pressure. Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure. Bulkheads – Classifications, Cantilever sheet Piles in Sandy soils and clay soils. Analysis of Anchored bulkheads – free earth support and fixed earth support methods.

NOTE : This course does not cover structural design of foundations.

References:

1. Analysis, Design of foundations and Earth retaining structures by Shamsher Prakash, Gopal Ranjan and Swami Saran.
2. Foundation Analysis and Design – J. E. Bowles.
3. Soil Mechanics and Foundation Engineering – By K.R. Arora.

CE325 - FLUID MECHANICS - III

Dimensional Analysis and Similitude:
Fundamental Concepts of Dimensional Analysis – Importance of Dimensional Analysis & Model Study; Units and Dimensional Formulae for Various Engineering Quantities; Fourier Concept of Dimensional Homogeneity.

Methods of Arriving at Dimensionless Groups – Non-dimensional Parameters; Rayleigh's Method; Buckingham π method – Buckingham modified method; Omitted and Superfluous variables.

Examples in Dimensional Analysis – Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,

Similarity and Similarity Laws – Concepts of Similarity – Geometric, Kinematic and Dynamic Similarities; Modeling Criteria; Similarity Laws – Important Dimensionless Numbers – Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.

Application of Similarity Laws to Practical Problems – Bodies Completely Submerged in Fluids, Bodies subjected to Gravity and Viscous Forces, River Models – Manning's Law; Distorted Models – Depth distortion and slope distortion; Problems related to Modeling of Spillways, Ships and Pumps & Turbines.

Impact of jets:
Force exerted by fluid jet on stationary and moving flat and curved vanes, Torque and Work done by series of Moving Vanes.

Hydraulic Machines– Turbines:
Introduction and Classification of Turbines – Function of Prime movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbines; Choice of Type of Turbine – Specific Speed.

Working of Impulse Turbines & Design Principles – Components & Working Principles of a Pelton Turbine – Work Done; Hydraulic and Overall Efficiencies; Design of Pelton Turbine – Working Proportions; Governing Mechanism for a Pelton Turbine.

Working of Reaction Turbines & Design Principles – Components & Working Principles of a Francis Turbine – Work Done; Hydraulic and Overall Efficiencies; Design of Francis Turbine– Working Proportions; Governing Mechanism for a Francis Turbine. Draft Tube Theory – Functions and Types of Draft Tubes in Reaction Turbines, Efficiency of Draft Tube; Kaplan turbine and working proportions of Kaplan turbine.

Performance & characteristics of Turbines: Unit Quantities, Specific Speed and its importance; Model Relationships; Operating Characteristic Curves; Cavitation problem in Turbines – Thoma's Cavitation Factor.

Hydraulic Machines – Centrifugal Pumps
Functions of a Pump – Types of Pumps – Selection Criterion – Rotodynamic and Positive Displacement Pumps – Comparison between Centrifugal & Reciprocating Pumps.

Centrifugal Pumps – Components & Working principles of Centrifugal Pumps; Classification of Centrifugal Pumps – Impellers based on Shape and Type of Casing, Pump with Volute Casing, Pump with Vortex Chamber & Pump with Guide vanes, Closed, Semi-closed & Open Impellers, Axial, Radial & Mixed Flow Impellers; Working Head and Number of Stages, Single & Double Suction. Work done by Centrifugal Pumps – Pressure Change in a Pump, Manometric and Static Head – Velocity triangles – Effect of Vane Shape; Pump Losses and Efficiency – Pressure Rise in the Impeller – Minimum Starting Speed of pump – Multistage Pumps; Pumps in Parallel and Series; Cavitation – Limitation of Suction Lift, NPSH and its importance in Selection of Pumps. Performance Characteristics of Pumps – Similarity Relations and Specific speed of Pumps – Dimensionless characteristics – Constant efficiency curves of Centrifugal Pumps.

Hydraulic Machines – Reciprocating Pump & Hydraulic Ram:
Reciprocating Pumps – Fundamental concepts, Component Parts and Working principle of Single Acting and Double Acting Reciprocating Pumps – Discharge Coefficient, Volumetric Efficiency and Slip; Work done by

Reciprocating pumps – Work Done and Power Input – Indicator Diagram – Effect of Acceleration and Friction on Indicator Diagram – Maximum Speed of Rotation of Crank; Air Vessels and their principles – Modified Indicator Diagram in the presence of Air Vessels, Work Saved due to Presence of Air Vessel, Flow into and from Air Vessel.
Hydraulic Ram – Working Principle of Hydraulic Ram.

References:

1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.
3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
4. Hydraulic Machines, Jagadish Lal, Metropoliton Book Company.

CE 326 ELECTIVE – I

CE 326A REPAIR AND REHABILITATION OF STRUCTURES

Materials: Construction chemicals, Mineral admixtures, Composites, Fibre reinforced concrete, High performance concrete, polymer-impregnated concrete.

Techniques to test the existing strengths: Destructive and non destructive tests on concrete.

Repairs of Multistory structures: Cracks in concrete, possible damages to the structural element-beams, slab, Column, Footings, etc., Repairing techniques like Jacketing, Grouting, External prestressing, Use of chemical admixtures, Repairs to the fire damaged structures.

Foundation problems: Settlement of shallow foundations – repairs, sinking of piles, wells – repairs.

Corrosion of Reinforcement: Preventive measures – coatings –use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, flowing concrete.

Reference:

1. "Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.
2. "Concrete Structures: Repairs, water proofing and protection" by Philip H. perkins, Applied sciences publications Ltd., London, pp.302.
3. "Durability of concrete structure: Investigation, Repair, Protection" Edited by Geoffmang., E. & FN SPON, An imprint of Chapman & Hall, pp.270.
4. "Deterioration, maintenance and Repair of structures" by Johnson, McGraw Hill, pp.375.

CE326 B REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

REMOTE SENSING: Introduction, Basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces.

SENSORS AND PLATFORMS: introduction, passive sensor, active sensor, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential. Spatial, spectral, radiometric and temporal resolution.

IMAGE ANALYSIS: introduction, elements of visual interpretations, digital image processing- image preprocessing, colour systems, band selection image enhancement, image classification, supervised classification, unsupervised classification. Introduction to feature extraction (band arithmetic, NDVI)

GEOGRAPHIC INFORMATION SYSTEM: Introduction, key components, application areas of GIS and spatial referencing (coordinate systems and map projections).

DATA ENTRY AND PREPARATION: spatial data input, raster data models, vector data models, raster versus vector. Errors in data entry and topology.

SPATIAL DATA ANALYSIS: introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing. ILWIS 52N GIS-software tools

RS AND GIS APPLICATIONS in Civil Enginering:
Land cover and land use Mapping, Urban applications.
Hydrology-flood zone delineation and mapping, drought monitoring, groundwater studies and other watershed studies.

TEXT BOOKS :

1. Fundamentals of Remote Sensing by George Joseph, University Press, India.
2. Remote sensing and image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons
3. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
4. GIS by Kang–tsung chang, TMH Publications & Co.,

CE327 GEOTECHNICAL ENGINEERING LAB. – I I

1. Field identification & classification of soils
2. Unconfined compression test
3. CBR test/plate bearing test
4. Triaxial compression test
5. Direct sheartest
6. Vane sheartest
7. Relative density
8. Triaxial test
9. Differential freeswell and swell pressure test.
10. Consolidated drained
11. Demonstration experiments (subject to availability)
12. S.P.T.
13. Consolidated undrained Foundation models
14. Plate load test
15. Pressuremeter test
16. Field vane shear.

CE328 CONCRETE LABORATORY

1. Specific gravity and unit weight of cement
2. Specific gravity and unit weight of coarse and fine aggregates.
3. Determination of normal consistency of cement
4. Determination of initial and final setting time
5. Fineness of cement.
6. Determination of compressive strength of cement (for different grades of cement).
7. Bulking characteristics of sand.
8. Sieve analysis of coarse and fine aggregates and classification as per IS 383.
9. Workability tests on green concrete by using : Slump cone,Compaction factor apparatus,Flow table,Vee-Bee consistometer.
10. Tests on Hardened concrete.
11. Compressive Strength
12. Split tensile strength
13. Modulus of rupture
14. Design of concrete mix by using IS code method (for class work only)
15. Case studies on a) framed structures and b) plate girder brid

INDUSTRIAL TRAINING

To be held during summer vacation at the end of second semester of III year and evaluated in the 1st Semester of IV year

IV / IV B. E. (CIVIL ENGINEERING)

SCHEME OF INSTRUCTIONS

1st Semester:

Code	Title of Course	L	T	P	Total	Univ.Exam		Sels. Marks	Total Marks	Credits
						Hrs	Marks			
CE411	Water Resource Engineering – I	3	2		5	3	70	30	100	4
CE412	Transportation Engineering – I	3	1		4	3	70	30	100	4
CE413	Project Planning and Management	4	2		6	3	70	30	100	4
CE414	Environmental Engineering – II	4			4	3	70	30	100	4
CE415	Elective - II	4	2		6	3	70	30	100	4
CE416	Computer applications in Civil Engineering (Lab)	3		3	6	3	50	50	100	4
CE417	Transportation Engineering Lab.			3	3	3	50	50	100	2
CE418	Fluid Mechanics Lab. – II			3	3	3	50	50	100	2
CE419	Industrial Training[@]							100	100	2
		21	**9**	**9**	**39**		**500**	**400**	**900**	**30**

@ held during summer vaction after III year 2nd semester. Assessment as indicated along with the requirements given in the syllabus part.

ELECTIVE – II (COURSE NO. CE 415)

CE415 A Environmental Impact Analysis.
CE415 B Structural Dynamics
CE415 C River Engineering

IV / IV B. E. (CIVIL ENGINEERING)

1 st SEMESTER

CE411 WATER RESOURCES ENGINEERING – I

INTRODUCTION AND HYDROLOGICAL ASPECTS: Water Resources in India, Hydrology in water Resources Planning – Hydrologic Planning –Water budget equation;
Climate and Weather – Importance of monsoon rains, clouds, storms and precipitation - Precipitation – Types, Measurement of rainfall; Influence and feedbacks of hydrological changes due to climate change; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve, Depth –Intensity, Depth-Area-Duration curves, frequency of point rainfall – Intensity-Duration-Frequency (IDF) curves, Probable Maximum Precipitation (PMP) curves; Infiltration – Factors affecting and its determination, Infiltrometers; Evaporation and Evapotranspiration – Pan Evaporation; Runoff – Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph; S-hydrograph, Synthetic Unit Hydrograph; Stream flow measurement – Gauge discharge curves.

GROUND WATER FLOW: Mechanics of interstitial flow, definitions, subsurface distribution of water, ground water movement; Darcy's law; Permeability – Intrinsic permeability; Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Well losses; Specific capacity of well; Well efficiency – Pumping tests – Recuperation test method for determination of well yield.
Rain water Harvesting & Recharging of underground storage – Methods of recharging – Infiltration galleries, Infiltration wells, Springs.

Methods of construction of open well-yield of an open well – Methods of construction of Tube Wells, Well shrouding and Well development, Spacing of tube wells, Design of tube well; Pumping requirements, Centrifugal and bore hole type pumps; Collector wells.

RESERVOIR PLANNING AND FLOOD ROUTING: Types of reservoir – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Design studies, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield from a reservoir of given capacity; Operating schedules – Rule Curve for reservoir operation; Economics of Water resources Projects – Apportionment of total cost of a Multi Purpose project, Benefit - Cost Ratio; Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation.

Flood Routing – Hydrologic reservoir routing by Puls method of routing, Channel routing by Muskingum method.

IRRIGATION: Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Depth of water held by soil in different zones, Water extraction – Quality of irrigation water, Irrigation efficiencies – Soil moisture – Irrigation relationship – Estimating depth and frequency of irrigation on the basis of soil moisture regime concept; Water requirements of crops, Duty, Delta and Base period – Their relationship, Crops – Seasons, Factors affecting duty and methods of improving duty, Consumptive use of water –Determination of evapotranspiration – Blaney-Criddle and Penman equations and Hargreaves method; Determination of canal capacities for cropping patterns, Size of reservoir, Assessment of irrigation water charges.

CANAL SYSTEMS: Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy's and Lacey's theories, Critical tractive force method, Design problems – Balancing depth – L.S. of a channel – Design according to I.S : 7112, 1975; Schedule of area statistics, Cross section of an irrigation channel – Maintenance of irrigation channel. Regulation of channel system – Canal outlets, Requirements of a good outlet – Types of outlets; Water logging – Causes and control – Land drainage; Canal lining – methods, Design of lined canals, Canal navigation – Requirements, Methods to make navigability feasible.

References:

1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
4. Engineering Hydrology, Subramanya, K., Tata McGraw-Hill Education Private Limited.
5. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.
6. Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press.
7. Hydrology: Principles, Analysis and Design, Raghunath, H.M.,New Age International.
8. Raghunath, H.M., Ground Water, New Age International.

CE 412 TRANSPORTATION ENGINEERING – I

Highway Engineering – I : Highway development and planning, Classification of roads, Highway alignment, Highway Geometrics – Design of Cross sectional elements, Sight distance, horizontal and vertical alignment.

Highway Engineering – 2: Traffic Engineering – Traffic Characteristics, Traffic studies (Surveys), Traffic Control devices – Design of intersections. Design of pavements – Design factors, design of flexible pavements – Group Index method, CBR Methods, Design of Rigid pavements – Wester guard equations, I.R.C. recommendations for design of concrete roads.

Highway Engineering – 3: Construction of roads – Earthen roads – W.B.M. roads – Bitumens roads – Cement concrete roads – Highway materials and their properties and tests. Maintenance of all types of roads – Highway drainage – Arborical culture – Street lighting.

Airport Engineering: Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

References:

1) Highway Engineering by Khanna & Justo.
2) Highway Engineering by Sharma & Sharma.
3) Airport planning and Design by Khanna & Arora.

CE413 PROJECT PLANNING AND MANAGEMENT

PERT and CPM : Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Barcharts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.

Cost analysis / updating / resource scheduling: Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimising project cost, crash limit, Free float limit, Optimisation. Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource levelling, circle notation and arrow notation.

Contracts: Contracts – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Master Roll Form 21. Piece work Agreement form, work order; Contract system with tenders – Definitions – Contract ,Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lumpsum contract; Lumpsum and schedule contract, Item rate contract, sub-contracts, joint ventures, Areitration Disputes and claim settlement.

Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personnel Department.

Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

References:

1) PERT and CPM – L. S. Srinath.
2) PERT and CPM – Punmia.
3) Estimating and Costing – B.N. Dutta.
4) Construction Management and Planning – Guna and Sen Gupta, B.

CE414 ENVIRONMENTAL ENGINEERING – II

Introduction to sanitation – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers—safety of sewer workers .

Storm sewers- design: Pumping of wastewater – Pumping stations – location – components parts– types of pumps and their suitability with regard to wastewaters. House Plumbing: plumbing systems of drainage-sanitary fittings and other accessories– single stack system- one pipe and two pipe systems – Design of building drainage.

Bacteriology of sewage: Sewage characteristics – Physical, Chemical and Biological Examination– decomposition- cycles of decomposition–- Sampling and analysis of wastewater – BOD-COD-Treatment of sewage - Primary treatment: Screens-grit chambers – grease traps – floatation – sedimentation – design of primary and pretreatment units..

Secondary treatment: Aerobic and anaerobic treatment process-comparison.
Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes,miscellaneous methods, Oxidation ponds, Oxidation ditches,Aerated Lagoons.

Attached Growth Process: Trickling Filters – mechanism of impurities removal- classification– filter problems – design and operation-recirculation. RBCs, Fluidized bed reactors, sewage disposal methods.

Anaerobic Processes: Septic Tanks and Imhoff tanks-Principles and Design-sludge treatment and disposal-Fundamentals of UASB. Biosolids (Sludge): Characteristics- thickening – digestion,drying and sludge disposal,.

References:

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Environmental Engineering by Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. McGraw-Hill international edition
3. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K. Khanna Publishers
4. Sewage treatment and disposal by Dr. P.N. Modi.
5. Water supply and Waste Water Engineering by Dr. B.S.N. Raju

CE415 ELECTIVE – II

CE415 A ENVIRONMENTAL IMPACT ANALYSIS

Introduction to EIA. Definition of E IA and EIS.C.E. Guidelines in USA, preparation of EIS, Elements of EIA (1 question either/or).

Agency Activities, Environmental setting. Environmental attributes, air, water, soil, ecology, noise Socio-Economic aspects, Culture and human aspects (Human settlements – rehabilitations) (1 question either/or).

Environmental impacts, Identification measurement, Aggregation, Secondary and Cumulative Impacts (1 question either/or).

Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement (1 question either/or).

Case studies, Economic impact analysis energy production impact analysis, cost benefit analysis, Environmental impact mitigation and control measures. (1 question either/or).

References:

1. Environmental Impact Analysis – Urban & Jain.
2. Environmental Impact Analysis – Canter, Mc. Graw Hill Publishers

CE415 B STRUCTURAL DYNAMICS

Introduction to Structural Dynamics – Types of prescribed Loads – Analysis of Dynamical behaviour of Structures – Mathematical and Analytical Models – Degrees of Freedom. Single degree freedom – Un-damped and Damped Systems - Free body diagram – Solution of Differential equation of Motion – Frequency, Period and Amplitude – Logarithmic decrement – Simple Problems.

Free Vibration of SDOF Systems – Response of SDOF System to Harmonic Excitation, Dynamic Excitation – Rayleigh's method- Vibration measuring instruments, Types of Damping Systems – Response Spectra.

Mathematical model of MDOF Systems – Vibration of Un-damped two Degrees of Freedom system – Simple Problems – Free Vibration of MDOF System – Natural Frequencies & Mode shapes – Mode Superposition method as per IS 1893 Code of Provisions.

Shear Building – Free Vibration of Shear Building – Dynamic Analysis of Simple Beam, Plane Frame and Plane Truss – Equation of Motion – Formulation of Element Stiffness Matrix only.

Introduction to Earth Quake Response of Structures – Response of SDOF and MDOF systems to earth quake excitation – Simple problems on SDOF System - Concept on Seismic Design – IS 1893 (1984) – Provisions for Seismic Design of Buildings.

Text Book:

1) Structural Dynamics by Mario Paz

References:

2) Dynamics of Structures by R.W. Clough & J. Penzien
3) Dynamics of Structures by Anil . K. Chopra
4) Earth quake engineering by A.R. Chandrasekharn & Jaikrishna.

CE415 C RIVER ENGINEERING

Incipient Motion of Sediment Particles. Critical tractive force.
Regimes of Flow: Ripple and dune regime, antidune regime, importance of regimes of flow. Bed Load Transport: Bed load equations. Suspended Load Transport: General equation of diffusion, integration of sediment distribution equation, method of integrating curves of concentration X velocity, simple relations for suspended load.

Bed Level Variation in Alluvial Streams: Continuity equation for sediment, equilibrium depth of scour in long channel contractions, general mathematical models, silting of reservoirs, local scour.
Variation in Plan form of Streams: Secondary currents, flow in rigid boundary open channel bends, scour and deposition at Alluvial Bends, sediment distribution at channel bifurcations, meandering, lateral migration of Alluvial Streams cutoffs, delta formation.

Sediment control in Canals: Methods of sediment control.
River Training: Objective of river training, river training for flood control, navigation, guiding the flow, sediment control, stabilization of rivers.
Alluvial River Models, Debris Flows, Density Currents.

Unsteady Flow: Governing Equations for one – dimensional flow, channel routing, kinematic routing, diffusion routing, Muskingum – Cunge routing.

References:

1) Mechanics of sediment transportation and Alluvial stream problems, R.J. Garde and K.G. Ranga Raju, Wiley Eastern limited, 1977.
2) Open channel flow, M.Hanif Chaudhry, Prentice hall of india private limited, 1994.

CE416 COMPUTER APPLICATIONS IN CIVIL ENGINEERING (C A C E)

Determination of Bending moment, deflection for different loading conditions for a simply supported beam and cantilever beam. Determination of fixed end moments for different loading conditions of a fixed beam.

Estimation of Run off for a catchment. Estimation of friction factor for laminar and turbulent flows, minor losses in pipe flow. Conversion of angles from WCB to RB. Classification of soils, determination of coefficient of permeability, degree of consolidation and shear strength.

Computation of water surface profiles in open channel flows. Estimation of settlement of foundations in cohesive soil, stability analysis of slopes. Estimation of earth pressure in cohesive and cohesion less soils.

Basic AUTO CAD commands, application of drafting tools and modifying tools, creation of 3 Dimensional solids.

Application of STAAD Pro for the analysis and design of various structural components of Civil Engineering and Building Frames.

Text Book:

1. Computer aided design-Software and Analytical tools by C.S. Krishnamoorthy & S. Rajesh.

Reference:

1. Computer aided design in reinforced concete, V.L.Shah.

CE417 TRANSPORTATION ENGINEERING LABORATORY

Testing of Aggregates: Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & Soundness.
Testing of bituminous material: Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.

Testing on Soils: C.B.R. test (IS 2720 – Part-XVI) – N.D.C. Penetration test (IS 2720 Part-XXXII) – Group Index.
Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration)

References:

1) Highway material testing by Khanna & Justo.

CE418 FLUID MECHANICS LABORATORY– II

1) Study of Characteristics of a hydraulic jump – To measure and draw $(E_1-E_2)/E_1$ vs F_1 and L_j / y_2 vs F_1, and compare with theoretical results wherever possible.
2) Study of Rugosity coefficients in an open channel flow.
3) Study of major losses in pipes – Pipe friction – To compute Darcy- Weisbach friction factor.
4) Study of Drag characteristics of a circular cylinder with its axis normal to the direction of flow.
   (a) To measure the pressure distribution on the surface of a cylinder and plot the dimensionless pressure variation around the cylinder and compute the pressure drag.
   (b)To measure the velocity variation in the wake of the cylinder, velocity of approach, and compute the total drag by momentum principle.
5) Study of performance characteristics of a centrifugal pump – To measure the discharge, head developed, and power input at various discharges for centrifugal pump and draw the performance characteristics.
6) Study of performance characteristics of a reciprocating pump – To measure the discharge, head developed, and power input at various discharges for reciprocating pump and calculate percentage slip and efficiency.
7) Study of performance characteristics of a Pelton turbine – To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.
8) Study of performance characteristics of a Francis turbine – To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.
9) Study of impact of a jet on flat and curved vanes.

CE419 INDUSTRIAL TRAINING

The students are supposed to submit a detailed report covering the following aspects related to civil engineering projects that are relavant to the industry in which they received training:

Project Planning, Design, Scheduling,
Specifications,
Tender Document Preparation, Calling of Tenders,
Material Procurement Methods / Pracices,
Inventory, Stores Maintenance and Material Issue Norms,
PERT / CPM Details,
Project Execution,
Check Measurement,
Project Management,
Quality Control,
Safety and Risk Analysis and
Maintenance, Repairs and Operation.

The report will be evaluated for 100 marks by a viva-voce committee comprising of the following members:

Head of the Department, Two internal Examiners, One external examiner and Chairman Board of studies.

IV / IV B. E. (CIVIL ENGINEERING)

SCHEME OF INSTRUCTIONS

2 nd Semester

Code	Title of Course	L	T	P	Total	Univ.Exam		Ses. Marks	Total Marks	Credits
						Hrs	Marks			
CE421	Transportation Engineering II	3	1		4	3	70	30	100	4
CE422	Water Resources Engineering II	3	2		5	3	70	30	100	4
CE423	Elective – III	4	2		6	3	70	30	100	4
CE424	Elective – IV	4	2		6	3	70	30	100	4
CE425	Project Work			6	6	--	50	50	100	8
FE 02	Free Elective-II	4			4	3	70	30	100	4
		18	**7**	**6**	**31**		**400**	**200**	**600**	**28**

ELECTIVE – III (COURSE NO. CE 423)

CE423 A Finite Element Methods of Analysis
CE423 B Solid Waste management
CE423 C Soil Dynamics & Machine Foundation
CE423 D Principles of Water Quality Management

ELECTIVE – IV (COURSE NO. CE 424)

CE424 A Air Pollution Control
CE424 B Ground Improvement Techniques
CE424 C Prestressed Concrete
CE424 D Coastal Engineering
CE424 E Hydraulic Structures

IV / IV B. E. (CIVIL ENGINEERING)

2 nd SEMESTER

CE421 TRANSPORTATION ENGINEERING– II

RAILWAY ENGINEERING – 1 : Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings.

RAILWAY ENGINEERING – 2 : Track Geometric design – Points & Crossings – Track drainage – Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

DOCK & HARBOUR ENGINEERING: Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

TUNNEL ENGINEERING: Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

References:

1) Railway Engineering by S.C. Saxena & S. Arora.
2) Railway Engineering by Rangwala.
3) Dock & Harbour by Birdie.
4) Tunnelling by Rangwala.

CE422 WATER RESOURCES ENGINEERING – II

Storage Works: Classification of dams, Factors governing selection of types of dam, Selection of site, Preliminary investigation.

Gravity Dams : Forces acting on a gravity dam, Stability criteria, Modes of failure – Elementary and Practical profiles, Stability analysis, Principal and shear stress – Construction joints, Openings in dams – Galleries, Foundation treatment of gravity dam.

Earth Dams: Types, Foundation for earth dams, design of earth dams, Causes for failure of earth dams, Criteria for safe design, Phreatic line, Seepage analysis – Seepage control through body and foundation.

Spillways: Essential requirements, Spillway capacity, Components, Types of spillways and their working, Design of ogee spillway, Energy dissipation below spill way, Scour protection, Use of hydraulic jump as energy dissipater – Design of stilling basins – USBR and IS standard basins; Spillway crest gates – Different types.

Diversion Head Works: Types, Location and components, effects of construction of weirs on permeable foundation, Bligh's, Lanes and Khosla's theories, Method of independent variables, Design principles of weirs and barrages, Design of weirs on permeable foundations, Design of vertical drop weir, Silt control devices.

Regulation Works: Canal falls – Definition, Necessity and location, Classification of falls, Design principles of syphon well drop, Notch fall, Sarada fall, Straight glacis fall; Offtake alignment; Cross regulator and Distributary head regulator – Design of cross regulator and Distributor head regulator.

Cross Drainage Works: Types, Factors affecting the suitability of each types, Classification of aqueducts, Design principles of different types of aqueducts.

River Training Works: River Training and its objectives, Classification of river training works, Marginal embankment, Guide banks, Groynes, cutoffs, Bank pitching, Launching aprons, Miscellaneous types of river training works.

Water Power engineering: Development of hydro power in India, Assessment of available power, Utilisation factor, Load factor, Diversity factor, Storage and Pondage; Types of hydro power schemes; Components of hydel schemes – Fore bay, Intake structure, Trash racks, Surge tanks; Water hammer pressure, Substructure and Superstructure of power house.

References:

1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
4. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.

CE423 ELECTIVE – III
CE423A FINITE ELEMENT METHODS OF ANALYSIS

Matrix methods of Analysis - Introduction, Analysis of beams and Portal Frames (One bay, one storey Two bay, two storey) by stiffness method.

Matrix methods of Analysis - Introduction, Analysis of beams and Portal Frames (One bay, one storey Two bay, two storey) by flexibility method.

Introduction: A brief history of F.E.M, Need of the method, Applications of FEM, Review of basic principles of solid mechanics, Basic equation in Elasticity Equations of equilibrium, Constitutive relationship, Concept of Plane Stress, Plain Strain, Concept of Axi-symmetric elements. Concept of Energy Principles and methods.

Basic theory relating to the formulation of the finite element method, element shapes ,nodes , nodal degree of freedom, node numbering, Coordinate system (local and global), Convergence requirements, Compatibility requirement, Geometric Invariance.

Finite element analysis of - single bar element(One –Dimensional problem) – Shape functions, derivation of stiffness matrix, stress-strain relations– All with reference to bar element and trusses under axial forces.

Text Books:

1. Structural Analysis – A matrix approach by G S Pandit and SP Gupta, Tata McGraw-Hill Publishing Company Limited.
2. Matrix Method of Structural Analysis, by Bhavikatti S. S., Charotar Publications.
3. “Introduction to Finite Element Method” by Desai, C.S. and Abela, J.F., Van Nostrand, 1972.
4. “Introduction to Finite Elements in Engineering”, Tirupathi R. Chandrupatla, Ashok D. 5.Belegundu, Prentice-Hall of India Private Limited, New Delhi.
6. “Finite Element Analysis”, by S.S.Bhavikatti, New Age International Publishers.
7. “Finite Element Analysis”, by C.S.Krishnamoorthy, Tata McGraw-Hill Publishing Company Limited.

References:

1. Basic Structural Analysis – C.S. Reddy, Tata McGraw Hill, New Delhi.
2. “The Finite Element Method in Engineering Science” by Zienkiewicz, P., McGraw Hill, 1971.
3. “Finite Element Methods for Engineers” by Reger, T. Fenuer, The Macmillan Ltd., London, 1975.
4. “Fundamentals of Finite Element Techniques for Structural Engineers” by Drabbia, C.A. and Conner, J.J., John Wiley and Sons, 1971.
5. “Finite Element Analysis Fundamentals” by Richard H. Gallagher, Prentice Hall, 1975

CE423B SOLID WASTE MANAGEMENT

Introduction: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Solid Waste Management: Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of Solid Waste management- Waste generation and handling at source- Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

Transfer and Transport of Wastes: Transfer station-Processing and segregation of the soilid waste- various methods of material segregation.

Processing and Transformation of Solid Wastes: Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration-advantages and disadvantages of incineration.

Disposal of Solid Waste: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

References:

1. Integrated Solid Waste Management by Tchobanognous
2. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

CE423 C SOIL DYNAMICS AND MACHINE FOUNDATIONS

Types of machine foundations – General requirements, Design criteria for machine foundations, Permissible amplitudes and bearing pressures.
Resonance and its effect – free and forced Vibrations with and without damping – Constant force and rotating mass type excitation – Magnification factor – Phase difference between forces and displacement for steady state vibrations – Logarithmic decrement.

Natural frequency of foundation – soil system – Barkan's and I.S. methods of determining natural frequency. Tachehotarioff's reduced natural frequency.
Elastic properties of soil for dynamical purpose and their experimental determination of shear modulus from wave theory.

Apparent soil mass – bulb of pressure concept – Pauw's analogy of foundation – soil system (charts to be supplied for solving problems).
Theory of elastic half – space lamb and the dynamic Boussinesq problem – Reisner's solution and its limitations – Quinlan and Sung's modifications Hsiegh's equations for vertical vibration.

Principles of design of foundations for reciprocating and impact type of machine – as per I.S. codes.- Vibration isolation – types and methods of isolation – isolating materials and their properties.

References:

1) Hand-book of machine foundations by Srinivasulu and Vaidyanathan – M/s. Tata McGraw Hill Publications.
2) I.S. Codes.
3) Soil Mechanics and Foundation Engineering by B.C. Punmia – M/s. Lakshmi publishing co.
4) Analysis and design of Foundations and Retaining Structure by Shamsher prakash, Gopal Ranjan and Swamisaran – M/s Saritha Prakashan, Meerut.
5) Vibrations of soils and Foundation by Richart Hall and Woods Prentice Hall Inc., New Jersey.

CE 423 D: PRINCIPLES OF WATER QUALITY MANAGEMENT

Introduction- importance of water quality management-Pollution of surface water bodies – Rivers, Reservoirs and Lakes –The impacts on the natural water bodies -Sampling procedures for the estimation of characteristics.

Modeling the fate of pollutant in natural water: Fundamentals of process and mechanisms-Conventional Streeter-Phelps BOD-DO models, Critical deficit and time required to reach the critical deficit.

Fundamentals of ground water flow – variations of ground water levels, fluctuations due to Evapotranspiration, Meteorological phenomena

Groundwater pollution and management – Sources of ground water pollution and their effects – municipal, industrial, agricultural and miscellaneous, ground water basin investigations. Groundwater modeling techniques.

Introduction to Urban storm water quality management - Groundwater remediation – Groundwater recharging-recharging methods.

Reference Books:

1. Ground Water Technology by B. K. Todd.
2. An introduction to Water quality modelling. James,A.
3. Surface water quality modeling by Chopra, S.C

CE 424 ELECTIVE – IV

CE424 A AIR POLLUTION CONTROL

Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.

Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behaviour accumulation, estimation of pollutants – Effective stack height.

Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

Ambient air quality monitoring and stack monitoring.

Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

References:

1) Air Pollution Control Technology by T. Painter.
2) Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3) Air Pollution Control by K.V.S.G. Murali Krishna.
4) Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.

CE424 B GROUND IMPROVEMENT TECHNIQUES

In-situ densification Methods in granular soils – Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth.
In-situ Densification methods in cohesive soils, introduction, preloading or dewatering, drainwalls, sand drains, sand wicks, geodrains/banddrains, stone and lime columns, forced vaccum preconsolidation, thermal methods.

Grout injections, suspension and solution grouts, grouting equipment and methods, Applications.
Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls.

Geotextiles: Introduction, types of geotextiles; Functions and their application, tests for geotextile materials, geogrids, functions.
Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.
Stone columns, introduction, construction practice, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc.

References:

1) Construction and Geotechnical Methods in Foundation Engineering, Robert M. Koerner : McGraw Hill.
2) Principles of pavement design, E. J. Yoder: John Wiley and sons.
3) Foundation Engineering, Leonards, G.A.
4) Highway Engineering Khanna S.K. and Justo C.E.G Nemchand Publications.
5) Introductory Soil Mechanics and Foundations. Sowers G.F.

CE 424 C PRESTRESSED CONCRETE

Introduction, Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete. Materials for prestressed concrete, high strength concrete and high strength steel.
Prestressing systems (1) Fressinet System (2) Gifford Udall (3) Magnel Blatan System, Tensioning devices, anchoring devices. (d) Pretensioning and Post tensioning.

Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to curvature etc. I.S. code provisions.

Analysis of prestress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Limit state design of flexural members, stress, I.S. code provisions, design of symmetrical beams, design of prestressed concrete poles, design for shear, I.S. code provisions.

(a) Transfer of prestress (Pretensioned members), Transmission length, bond stress, Transverse tensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.
(b) Anchorage zone in post tensioned members, stress distribution in end block, Guyon's method of approach of analysis of end block (Not more than 2 cables).

References:

1) Prestressed Concrete by P. Dayaratnam.
2) Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns.

CE424 D COASTAL ENGINEERING

Mechanics of Wave Motion : Wave fundamentals and classification of waves, small amplitude wave theory, wave celerity, length, and period, orbital motions, pressure distribution, wave trains and wave energy, transformation of waves, higher order wave theories, stokes higher order wave theories, cnoidal wave theory, wave refraction, wave diffraction, wave reflection, wave breaking.

Tides, Storm surges, Tsunamis - Wave Prediction : Wave height variability, energy spectra of waves, directional spectra of waves, wind information needed for wave prediction, estimating the wind characteristics, delineating a fetch, forecasts for lakes, bays, and estuaries, significant wave method, wave spectrum method, forecasting wind waves in shallow water, deep water relation for wave decay, hurricane waves.

Littoral Processes: Ocean currents, long shore currents and setup due to ocean waves, sediment transport in the offshore zone, surf zone, bar-berm prediction and budget of the littoral zone.

Wave runup, over topping and transmission - Wave Forces: Wave forces on cylinders and walls.

REFERENCES:

1) Estuary and coastline hydrodynamics, Ippen, A.T., and Mc Graw – Hill book company Inc., 1966.
2) Basic coastal engineering, Sorensen, R.M., John Wiley & Sons, 1978.
3) U.S. Army Coastal Engineering Research Center, Shore protection manual, Vols. I, II and III, 1977.

CE424 E HYDRAULIC STRUCTURES

Straight Gravity concrete Dams : Single-step design, multiple-step design, Internal stresses in gravity dams, stress distribution around openings, stress distribution around a circular hole in an infinite plate due to a normal stress on the plate, stress distribution around a horse shoe shaped gallery using phillips and zanger's tables, design of reinforcement around galleries in dams.

Arch Dams: Economic central angle of an arch dam, constant radius method, constant angle method, and variable radius and variable angle design of arch dams, trial load method of analysis of arch dams.

Earth Dams: Seepage analysis, stability analysis of infinite slopes with and without seepage, stability analysis of finite slopes – friction circle method, method of slices, ordinary method of slices, simplified Bishop Method of slices, spencer's method.

Spillways: Hydraulic design of ogee spillways, comprehensive discharge characteristics of ogee spillways, design of reinforcement in the crest region of an ogee spillway, hydraulic design of chute spillways, morning glory spillways, side channel spillways.
Stilling basins and energy dissipaters: Intake Structure:

Water Conductor System: Selection of type of water conductors, economic analysis for determination of sizes of water conductors, analysis and design of lined pressure tunnels, water hammer analysis, analysis and design of surge tanks of various types, design of anchor blocks for penstocks, design of penstock junctions, design of scroll cases and draft tubes.

Gates and Valves : Vertical lift gates, tainter gates, cylindrical gates, butterfly valves, Howell – Bunger valves, needle valves, flow induced forces on vertical lift gates, flow induced vibration of vertical lift gates.
Layout of Power Houses.

References:

1) Engineering for dams, Vol.II, Creager, W.P. Justin, J.D., and Hinds J., Wiley Eastern Private Ltd,
2) Hydro electric hand book, Creager W.p. and Justin J.D. John Wiley & Sons Inc., Newyork, 1949.
3) U.S.B.R. Design of small Dams, 1960.
4) Handbook of applied hydraulics, Davis and Sorensen.
5) Soil Mechanics , Lambe and Whitman,
6) Hydraulic Transients, Streeter, V.L. and Wylie, G.B. Mc Graw Hill Book Company, 1967.
7) Applied Hydraulic Transients, Hanif Chaudhry, M. Van Nostrand Reinhold Company, 1979

CE425 PROJECT WORK