Shri ShamraoPatil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur
(An Autonomous Institute)

Department: Civil Engineering
Rev: Course Structure /01/NEP/2023-24
Class: S.Y. B. Tech.
Semester: III

Course Code	Course Type	Course	Teaching Scheme				Examination Scheme					Credits
			L	T	P	Total hrs.	CAI	CAII	MSE	ESE	Total	
23CE2301	PCC	Engineering mathematics -III	03	-	-	3	10	10	30	50	100	03
23CE2302	PCC	Strength of Materials	03	-	-	3	10	10	30	50	100	03
23CE2303	PCC	Surveying –I	03	-	-	3	10	10	30	50	100	03
23CE2304	HSSM	Entrepreneurship Development	01	-	-	1	25	25	-	-	50	01
23CE2305	PCC	Strength of Materials Laboratory	-	-	02	2	25	25	-	-	50	01
23CE2306	PCC	Surveying –I Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2307	VSEC	Introduction to Drawing Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2308	CEP	Mini Project-II	-	-	02	2	25	25	-	-	50	01
23CEMDXX	MDM	Multidisciplinary Minor- I	02	-	-	2	10	10	30	50	100	02
23OECE21	OE	Open Elective-I	02	-	-	2	10	10	30	50	100	02
23HSSM01	VEC	Aptitude skill- I	01	-	-	1	25	25	-	-	50	01
23HSSM02	VEC	Language skill-I	-	-	02	2	25	25	-	-	50	01
23MILEXX	AEC	Modern Indian Language	02	-	-	2	25	25	-	-	50	02
TOTAL			**17**	**-**	**10**	**27**	**230**	**230**	**150**	**290**	**900**	**22**

Multidisciplinary Minor - I

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Construction Equipment (23CEMDA1)	Building Material and Management (23CEMDB1)	Modes of Transportation (23CEMDC1)

***Open Elective course will be offered to students of other programs and will not be offered to students of the same program**

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Engineering Mathematics-III

23CE2301	PCC	Engineering Mathematics-III	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Engineering Mathematics-I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the Vector differential operator on scalar and vector point functions. Define and discuss the concept of vector Integration
CO2	Apply the Knowledge of Linear differential Equation for solving various mechanical problem
CO3	Solve partial differential equations and use of separation of variable method to solve heat and Laplace equations
CO4	Develop basic mathematical tool for fitting of curve like linear and non-linear curve and regression
CO5	Illustrate and formulate fundamental probability distribution and density function as well as functions of random variable
CO6	Apply Binomial, Poisson and normal distribution for approximate probability

Course Content:

Unit 1: Vector Calculus Physical interpretation of vector differentiation, vector differential operator, Gradient, Divergence and curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential line, Surface and volume integrals, work-done, Green's lemma, Gauss's Divergence theorem, Stokes theorem(Without Proof), Problem	[6]
Unit 2: Application of Linear Differential Equations with constant Coefficients Basic of Linear differential equation, Modeling of problem on bending of beams, whirling of shafts and mass spring system	[6]
Unit 3: Partial Differential Equations Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Method of separation of variables - applications to find solutions of one dimensional heat flow equation ($\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$), and two dimensional heat flow equation (i.e. Laplace equation ; $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$)	[6]

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Unit 4: Curve Fitting Line of regression of bi-variate data, Fitting of curve by method of Least squares fitting of straight Lines, Fitting of Parabola and fitting of exponential curve	**[6]**
Unit 5: Basic Probability Definition and concept of probability: Addition theorem of probability, multiplication theorem of probability (without proof), conditional probability, Bayes theorem, Examples. Random Variables, probability distribution, probability mass function, probability density function, Mathematical expectation, join and marginal probability distribution, properties of expectation and variance with proofs	**[6]**
Unit 6: Theoretical Probability Distributions Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.	**[6]**

Text books:

1. P. N. Wartikar& J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune.
2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.

Reference books:

1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

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Strength of Materials

23CE2302	PCC	Strength of Materials	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Engineering Mechanics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the concept of stress and strain.
CO2	Illustrate the shear force, bending moment and Develop the SFD, BMD for determinate Beam.
CO3	Explain the concept of torsion for circular shaft and thin cylinder.
CO4	Illustrate the bending stresses in the beam.
CO5	Illustrate the shear stresses in the beam.
CO6	Analyze the combined direct and bending stresses for column.

Course Content:

Unit-1 Stress-Strain Engineering properties of different materials, Simple stress and strain, Hook's law, Stress-strain curves for Brittle and Ductile materials, Allowable Stresses and factor of safety Elastic constants and their relation, Temperature stresses, Principle of superposition, Elongation of uniform bars, stepped bars and composite bars and Numerical examples, Normal stress and strain in three dimensions.	[6]
Unit-2 Shear Force and Bending moment Introduction: types of beams, supports and loading. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combination.	[6]
Unit-3: Torsion and Thin cylinder Theory of torsion, Assumptions, Derivation of torsion formula, Stress, strain and deformation in determinate and indeterminate shafts of solid, hollow, homogeneous and composite cross-section subjected to twisting moment, Power transmitted through shaft. Thin Cylinder- Theory of thin cylinder. Thin cylinder subjected to internal fluid pressure, circumferential stress, Longitudinal stress, Concept of Efficiency of joint, Wire winding of thin cylinder.	[6]
Unit 4: Bending stresses Theory of pure bending, Derivation of flexural formula, Moment of resistance, Simple design problems for rectangular and flanged sections, Concept of flitch beam.	[6]
Unit 5: Shear stress Concept of shear, Derivation of shear stress formula, Stress distribution diagram for standard sections,	[6]

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Maximum and average shear stress for circular and rectangular sections, Design problems for rectangular & flanged sections	
Unit 6: Direct and Bending stress Concept of direct and bending stress, columns subjected to eccentric loading, core of section, chimney subjected to wind pressure. Concept of earth retaining wall & stability of dam.	**[6]**

Text books:

1. Junnarkar S.B. (2014), "Mechanics of Structures "Vol.I, Charotor Publishers, Anand, 31st edition,
2. Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
3. Ramamrutham S., "Strength of Materials", Dhanpatrai and Sons, Delhi
4. S.S.Bhavikatti, Strength of Materials, 2nd Edition Vikas Publications, New Delhi 2006. 4. R. Subramanian, Strength of Materias, Oxford University Press 3rd edition 2016.
5. R.K.Bansal, "Strength of Material", Laxmi Publication(s) ltd.

Reference books:

1. Punmia B. C., "Mechanics of Materials" Laxmi Publications, revised edition, 2016
2. Subramanian R., "Strength of Materials" Oxford University Press, 2nd edition, New Delhi
3. F. L. Singer and Pytel, "Strength of Material" Harper and Row publication.
4. J.B. Popov, Prentice, "Introduction to Mechanics of Solids" Hall publication.
5. James M. Gere, "Mechanics of Materials", Brooks/Cole. Publishing Co.,6th edition, 2008.

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Surveying-I

23CE2303	PCC	Surveying-I	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs./week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Basic Civil Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the instrument and methods required for recording the field measurement.
CO2	Identify the instrument, methods used in angular measurements.
CO3	Illustrate in determining RL, and use of RL in establishing the contour lines.
CO4	Estimate area by formula, and using the instrument.
CO5	Demonstrate use of the theodolite for its various applications
CO6	Identify steps involved in preparing the gales table; and traverse plotting.

Course Content:

Unit 01: Linear measurement Introduction to surveying, Types of survey, Instrument used, Terms in chain surveying, field book entries, Chaining, ranging, and offsetting instrument required, plan and map scale, problems on scale.	[6]
Unit 02: Angular measurement Instruments used for angular measurement such as prismatic compass and surveyor's compass, concept of traverse and its types, plotting of traverse, traverse and its suitability, problems on included angles and finding corrected included angles.	[5]
Unit 03: Leveling and contouring Terms used in Leveling, Leveling instrument,Temporary adjustment, and necessity of permanent adjustment of levels , Problems on leveling, Term in contouring,necessity, Method of contouring, interpolation, contour plotting	[7]
Unit 04: Computation of Area Planimeter use for area determination, Area by field notes, Mid-ordinate rule, trapezoidal rule, and Simpsons rule	[5]
Unit 05: Theodolite Surveying Introduction to Theodolite (parts and functions), temporary adjustments; Application of Theodolite: Measurement of horizontal angle by direct method; repetition method; reiteration method, vertical angle, and concept of single plane trigonometric leveling	[7]

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Unit 06: Theodolite Traversing Methods used in theodolite traversing, check used in traversing, Preparation of Gale's table and transverse plotting, cases of omitted measurement.	**[6]**

Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune VidyarthiGrihPrakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune VidyarthiGrihPrakashan, Pune.

Reference Books

1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Entrepreneurship Development

23CE2304	HSSM	Entrepreneurship Development	1-0-0	1 Credit

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs./week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the entrepreneurship, its relevance and importance
CO2	Identify the how to become an entrepreneur
CO3	Identify the role of entrepreneurial leadership in the nurturing and growth of a startup
CO4	Identify how to run small business

Course Content:

Unit 1: Introduction of Entrepreneurship Entrepreneurship: meaning, importance of entrepreneurship, concepts, Characteristics, classifications of entrepreneurship, Entrepreneur v/s entrepreneur, Legal issues for Entrepreneur: Intellectual property rights	[3]
Unit 2: Women Entrepreneurs Women Entrepreneurs, working environment, challenges in the path of women entrepreneurs, empowerment, and Grassroots entrepreneurs through self help groups (SHG).	[3]
Unit 3: Building and Business Plans Building the business plan- Feasibility study: Setting up of Small business enterprises Financial Considerations: Basic financial statements, Managing Cash Flows, Sources of finance: Debt and Equity.	[3]
Unit 4: Sickness In Small Business Enterprises Sickness in small business enterprises: Definition and status of Sickness of SSI's in India, causes of sickness, Symptoms and cure of sickness	[3]

Text Books

1. Entrepreneurship and Small Business Management by Hitesh Jhanji, Excel Books Private Limited, A-45, Naraina, Phase-I, New Delhi-110028
2. Entrepreneurship by Sudhamathi Premnath, Shanlax Publications,61, T.P.K. Main Road, Vasantha Nagar, Madurai – 625003

Reference Books:

1. Entrepreneurship development in India-Dr. C.B. Gupta and Dr. N. P. Srinivasan.
2. Entrepreneurship development principles, policies and programs, P. Saravanveni
3. Dynamics of Entrepreneurship development in India- Vasant Desai.
4. Fundamentals of Entrpreneurship –Mohanty (PHI)

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Strength of Materials Laboratory

23CE2305	PCC	Strength of Materials Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Course Outcome: At the end of the course, students will be able to:

CO1	Determine the various properties of metals.
CO2	Determine the compression strength of timber.
CO3	Determine the compression strength of brick.
CO4	Apply shear test on metal

All experiments are compulsory

1. Introduction to Strength of material laboratory
2. Tensile test on mild steel, aluminum.
3. Compression test on mild steel, aluminum.
4. Compression test on timber, brick.
5. Impact test on mild steel, brass, aluminum and specimens.
6. Hardness test on metals
7. Shear test on mild steel/aluminum (Single and Double shear test).
8. Torsion test on mild steel and solid bars.
9. Flexural test on timber, mild steel beams.

Text books:

1. Junnarkar S.B. (2014), "Mechanics of Structures "Vol.I, Charotor Publishers, Anand, 31st edition,
2. Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
3. Ramamrutham S., "Strength of Materials", Dhanpatrai and Sons, Delhi
4. S.S.Bhavikatti, Strength of Materials, 2nd Edition Vikas Publications, New Delhi 2006. 4. R. Subramanian, Strength of Materias, Oxford University Press 3rd edition 2016.
5. R.K.Bansal, "Strength of Material", Laxmi Publication(s) ltd.

Reference books:

1. Punmia B. C., "Mechanics of Materials" Laxmi Publications, revised edition, 2016
2. Subramanian R., "Strength of Materials" Oxford University Press, 2nd edition, New Delhi
3. F. L. Singer and Pytel, "Strength of Material" Harper and Row publication.
4. J.B. Popov, Prentice, "Introduction to Mechanics of Solids" Hall publication.
5. James M. Gere, "Mechanics of Materials", Brooks/Cole. Publishing Co., 6th edition, 2008.

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Surveying-I Laboratory

23CE2306	PCC	Surveying-I Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks End Semester Exam : 20 Marks

Course Outcome: At the end of the course, students will be able to:

CO1	Use of chain/tape, compass, theodolite for data collection and recording
CO2	Determination of area by planimeter
CO3	Use of leveling instrument for RL determination
CO4	Evaluate the data required to prepare the gales table

All experiments and projects are compulsory

Part-I

Experiments

1. Experiment on chaining, ranging, offsetting
2. Use of prismatic compass in traversing
3. R L determination by rise and fall method and line of collimation method
4. Use of digital planimeter
5. Study of Theodolite
6. Measurement of vertical angle
7. Measurement of horizontal angle by direct method
8. Measurement of horizontal angle by repetition method
9. Measurement of vertical angle
10. Single plane trigonometric leveling

Part-II

Projects

1. Block Contouring
2. Theodolite Traversing

Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune VidyarthiGrihPrakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune VidyarthiGrihPrakashan, Pune.

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Reference Books

1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Introduction to Drawing Laboratory

23CE2307	VSEC	Introduction to Drawing Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	Continuous Assessment –I : 15 Marks Continuous Assessment –II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify symbols used in construction drawings.
CO2	Classify the different types of construction drawings.
CO3	Explain different types of civil engineering drawings.
CO4	Show a submission drawing of residential building.

All experiments are compulsory

List of experiments

1. Study of lettering, Numbering and Dimensioning.
2. Study of different types of scales used in engineering drawings.
3. Study of different symbols used in Civil engineering drawing as per IS962-1989.
4. Drawing simple objects for understanding of scales.
5. Study, collection and report writing of architectural drawing.
6. Study, collection and report writing of Site Plan
7. Study, collection and report writing of working Drawing.
8. Study, collection and report writing of Sectional plan
9. Study, collection and report writing of structural drawing
10. Study, collection and report writing of mechanical, electrical and plumbing drawing.
11. Study, collection and report writing of submission drawing and Blue print.
12. Prepare a submission drawing for G+1 Residential building.

Text books:

1. Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
2. Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
3. Jain A.K., The Idea of Green Building Khanna Publishers, N. Dehli,
4. V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons

Reference books:

1. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
2. I.S. 962 – 1989 Code for Practice for Architectural and Building

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Mini Project

23CE2308	CEP	Mini Project- II	0-0-2	1 Credits

Teaching Scheme:	Examination Scheme:
Practical: 2hrs/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Pre-Requisites: Mini Project-I

About Ideathon

The project is a part of addressing societal and industrial needs. An ideathon is a brief, intense event where students can work on some of the most important problems that the world is facing today. Ideation's are brainstorming events where people with diverse knowledge backgrounds, skill sets and interests get together to predetermined problems, and come up with substantive, innovative and comprehensive solutions. An ideathon's output might be ideas, a roadmap or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.

Course Content:

Week 1: Higher Education and Case Study Pedagogy • Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. • Allocation of mentor	[2]
Week 2: Topic Selection • Briefly interact with students to provide hand-holding for topic selection. • Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor • **Illustrative Examples : Any Industry or Societal Problem** • Finalization of Title.	[2]
Week 3: Case Study Design/Ideathon: Part 1 • If needed, provide hand-holding to students for finalizing objectives.	[2]

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• Review the objectives of the case study groups. • Identify what can be quantified related to your topic and how. • Decide objectives for your case study. • Continue reading especially recent work specific to your topic.	
Week 4: Case Study Design/Ideathon: Part 2 • Prepare a roadmap of your case study; identify what is to be measured on the field. • Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design • Prepare a questionnaire and try it out with your group members as mock. • Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 • Students in a group shall understand problem effectively, propose multiple solution. • The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 • The students have to finalize the best methodology to solve the problem in consultation with the project guide. • 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 • Identify appropriate data visualization tools for your case study. • Analyze the data	[2]
Week 9: Analysis-4 • Identify appropriate data visualization tool sfor your case study. • Analyze the data	[2]
Week 10: Report writing Part:1 • Prepare an outline of the report and start organizing the write-up for the first draft. • Prepare and submit the first draft of their port to the course coordinator.	[2]
Week 11: Report writing Part:2 • Make necessary corrections if any as per the suggestions of course coordinator. • Submit the final draft of the case study	[2]
Week 12: Final Presentation • 50% Presentation has to be conducted by mentor/guide based on above activity.	[2]

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MDM- I

23CEMDA1	MDM	Construction Equipment	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment –I : 10 Marks Continuous Assessment –II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Basic civil Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various equipment used in construction industry along with their function
CO2	Explain use of earth moving equipment
CO3	Explain use of compaction & hauling equipment
CO4	Explain use of concreting equipment
CO5	Justify equipment selection for particular activity
CO6	Select equipment based on economic analysis

Course Content:

Unit 1:Introduction Classification of Major Equipment ,Selection of equipment, Necessity, Advantages, Suitability	[4]
Unit 2:Introduction of Earth Moving equipment Earthwork Equipment Fundamentals, Types of earthwork equipment such as, Face shovel, Backhoe Dragline, Clamshell , Bulldozer, Loaders, Motor Graders, Scrapers etc.	[5]
Unit 3: Compaction & Hauling Equipment Uses of compacting equipment, Tamping Rollers, Sheep's Foot Rollers, Modified Tamping Rollers Smooth-wheel Rollers. Pneumatic-tyred Rollers, Vibratory roller, Different types of dumpers, Use of Bowser Paver, RMC Transit Truck, Conveyors etc.	[5]
Unit:4 Concreting Equipment Type Concrete Mixers- Drum type, Pan Type Concrete Mixers , Types of Cableways, Fixed Cableways, Luffing Cableways, Radial-travelling Cableways, Parallel-travelling Cableways, Concrete Batching and Mixing Plants, Batchers, Concrete Buckets-Cylindrical Buckets, Laydown Buckets, Bottom-dump Buckets Concrete Pumps, Introduction to RMC	[5]
Unit:5 Other Equipment Erection Equipment – Types of Crane, Types of pumps used in Construction, Equipment for Dewatering and Grouting, Equipment for Demolition.	[4]
Unit:6 Economy of Construction Equipment Equipment Records cost of Capital, Evaluating Investment Alternatives, Ownership cost, Operating And Maintenance cost, Replacement Decision.	[5]

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Text books:

Sharma, S.C., Construction Equipment & Management, Khanna Publications, New Delhi, 1988.

Reference books:

1. Chitkara, K. K., Construction Project Management Techniques and Practices, Tata McGraw Hill, New Delhi, 2004
2. Seetharaman, S., Construction Engineering & Management, Umesh Publications, 2007.
3. Peurifoy, L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw Hill, New Delhi, 8th Edition, 2010.
4. R.L. Peurifoy and W.B. Ledbetter, "Construction Planning, Equipments and Methods" McGraw-Hill Publishers. New Delhi
5. "Construction Machinery and Equipment in India". (A compilation of articles Published in Civil Engineering and Construction Review) Published by Civil Engineering and Construction Review, New Delhi, 1991

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MDM- I

23CEMDB1	MDM	Building Material and Management	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment –I : 10 Marks Continuous Assessment –II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Basic civil Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify Natural construction material
CO2	Classify different artificial construction materials
CO3	Select different types of finishing materials
CO4	Identify Recycled Construction material
CO5	Explain the concepts of resource management on site
CO6	Analyze of resource management on site.

Course Content:

Unit1: Natural Construction Material Asphalt, bitumen and tar used in construction, properties and their uses. Properties of lime, its types and Uses. Sand-Types of sand, Properties of sand and uses. Properties and Classification of coarse aggregate according to sizes and its uses	[4]
Unit2: Artificial Construction Material Introduction to Pre-cast concrete blocks and their uses, Types of glass and their uses, Metals used in construction-Steel, Aluminum-Properties and Uses, Fibers - Types -Jute, Glass, Plastic Asbestos Fibers properties and uses. Finishing materials-Paints-Oil Paints. Distempers and Varnishes with their uses (situations where used).	[4]
Unit3: Advanced Concreting Materials Hemp Reinforcement, Self-healing concrete, Bending, flexible concrete, Concrete Canvas, Liquid granite. Bio-Coal Lining	[4]
Unit4: Modern Construction Material Transparent Wood, Carbon Fiber, Sensi Tiles, Aerogel, Richlite, Transparent Aluminum, Solid Wood, Hydroceramics, Ultra-White Paint.	[4]
Unit 5: Resource Management Resource Management Men- Resource allocations - smoothening and leveling. Material Management- definition by international federation of purchasing and material management. Objectives. Role Functions, Qualities of Material Manager, Material forecasting.	[4]
Unit 6: Inventory Control Inventory Control- Necessity, Techniques such as ABC, EOQ, etc., lead-time, safety stocks.	[4]

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Text books:

1. A Text-Book of Building Construction, S.P. Bindra and S.P. Arora, Dhanpat Rai Publications "Building Materials" by S K Duggal

Reference books:

1. "Building Construction" by B C Punmia and Ashok Kumar Jain
2. "Building Material and Construction" by S S Bhavikatti
3. "Building and construction materials" by Gambhir M.L. and Neha Jamwal
4. "Building construction illustrated" by Ching Francis D.K.
5. "Building construction materials and techniques" by Raj P. Purushothama

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MDM- I

23CEMDC1	MDM	Modes of Transportation Engineering	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment –I : 10 Marks Continuous Assessment –II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Basic civil Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Summarize the key components and functions of transportation engineering.
CO2	Utilize knowledge of road classification systems and their effectiveness.
CO3	Apply knowledge of track components and materials in railway design.
CO4	Explain site investigation techniques and tunneling for tunnel projects.
CO5	Explain principles of airport site selection considering environmental and operational
CO6	Identify principles of port planning and development considering global trade requirements.

Course Content:

Unit 1: Introduction to Transportation Systems Overview of transportation engineering, History and evolution of transportation modes, Role of transportation in society and economy, Sustainability and environmental considerations in transportation.	[4]
Unit 2: Road Transportation Importance of road infrastructure, Role of road engineering in societal development, Road classification and hierarchy, Geometric design principles (horizontal and vertical alignment), Properties of pavement materials (asphalt, concrete, aggregates), Types of Pavement, Routine, periodic, and preventive maintenance.	[6]
Unit 3: Rail Transportation History and evolution of railway systems, Role of railways in transportation networks, Track components and materials in detail, Turnouts and switches, Types of rolling stock (locomotives, freight wagons, passenger cars.	[5]
Unit 4: Tunnel engineering Role of tunnels in transportation, water conveyance, and utilities, Site investigation techniques for tunnel projects, Geological and geotechnical considerations, Introduction to Tunnel Construction Methods (e.g. Cut-and-cover method, Tunnel boring machines (TBM) and their types, Sequential excavation method (SEM),New Austrian Tunneling Method (NATM)).	[6]
Unit 5: Aviation and airport Engineering Role of airports in air transportation, Factors influencing airport site selection ,Introduction of Runway design and layout considerations, Taxiway and apron design, Airport terminal design and functionality, Airport lighting and signage systems, Air traffic control systems and procedures	[5]

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Unit 6: Maritime and Waterway Transportation Role of maritime and waterway infrastructure in global trade and transportation, Introduction to Port planning and development, Introduction of port facilities (terminals, berths, quays) , Coastal processes and erosion control, Introduction of inland waterway systems, Introduction of marine structures (piers, jetties, marinas).	[4]

Text books:

1. "Transportation Engineering" by L.R. Kadiyali, Khanna Publishers
2. "Highway Engineering" by S.K. Khanna and C.E.G. Justo, Nem Chand & Bros
3. "Traffic Engineering and Transportation Planning" by L.R. Kadiyali, Khanna Publishers
4. "Railway Engineering" by Satish Chandra and M.M. Agarwal, Oxford University Press
5. "Railway Engineering" by S.C. Saxena and S.P. Arora, Dhanpat Rai Publications
6. "Airport Planning and Design" by S.K. Khanna, M.G. Arora, and S.S. Jain, Nem Chand & Bros.
7. "Air Transportation Planning and Design" by Vukan R. Vuchic, McGraw Hill Education
8. "Tunnel Engineering Handbook" by Bickel, John O., Kuesel, Thomas R., and King, Elwyn H., Springer
9. "Introduction to Tunnel Construction" by David Chapman, Nicole Metje, and Alfred Stärk, CRC Press
10. "Port and Harbour Engineering" by G. P. Mujumdar, Tata McGraw Hill Education
11. "Inland Water Transport" by R.R. Patra and B.N. Dutta, Dhanpat Rai Publications

Reference books:

1. "Transportation Engineering and Planning" by C.S. Papacostas and P.D. Prevedouros, Pearson Education
2. "Principles of Transportation Engineering" by Partha Chakroborty and Animesh Das, Prentice Hall India Learning Private Limited
3. "Principles of Transportation Engineering" by Partha Chakroborty and Animesh Das, Prentice Hall India Learning Private Limited
4. "Highway Material Testing" by S.K. Khanna, C.E.G. Justo, and A. Veeraragavan, Nem Chand & Bros.
5. "Principles of Railway Engineering" by S.C. Saxena, Dhanpat Rai & Co.
6. "Railway Track Engineering" by J.S. Mundrey, Tata McGraw Hill Education
7. "Engineering Rock Mass Classifications" by Z.T. Bieniawski, John Wiley & Sons
8. "Tunneling and Tunnel Mechanics: A Rational Approach to Tunneling" by Dimitrios Kolymbas, Springer
9. "Planning and Design of Airports" by Robert Horonjeff and Francis X. McKelvey, McGraw Hill Education
10. "Airport Engineering: Planning, Design, and Development of 21st Century Airports" by Norman J. Ashford, Saleh Mumayiz, and Paul H. Wright, John Wiley & Sons
11. "Marine Structures Engineering: Specialized Applications" by Gregory Tsinker, Springer
12. "Port Management and Operations" by Patrick Alderton, Informa Law from Routledge

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Aptitude Skill-I (Verbal Ability)

23HSSM01	VEC	Aptitude Skills- I	1-0-0	1 Credit

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Pre-Requisites: English Communication

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply sentence formation rules to spot the error
CO2	Solve the questions based on the types of tenses
CO3	Solve the questions based on Direct/Indirect Speech and Passive/active voice and Substitution and Elimination
CO4	Make use of Proverbs, Idioms and phrases in sentence construction and the vocabulary

Course Content:

Unit 1: Structure and Types of Sentences, Conditional Sentences	[3]
Unit 2: Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[3]
Unit 3: Direct and Indirect Speech, Active and Passive Voice Use of Modal verbs in Sentence Forming, Substitution and Elimination	[3]
Unit 4: Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence Vocabulary Building in Various Situations	[3]

Text books:

1. Raymond Murphy, Essential English Grammar with Answers, Murphy.
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)

Reference books:

1. Rao and D,V,Prasada, Wren & Martin High School English Grammar and Composition
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition

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Language Skill- I

23HSSM02	VEC	Language Skill- I	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop flowchart and Algorithm to solve the given problem statements
CO2	Develops programs using Data Types and Operators
CO3	Make use of Decision Making and Looping Statements to develop conditional programs
CO4	Make use of Arrays to develop programs in C language

Course Content:

1. Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Deign Algorithms and Flowcharts.
2. Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.
3. Develop programs on Conditional, logical and Bitwise Operators.
4. Develop programs on Size of () and typecasting operator.
5. Develop programs on increment and decrement operator.
6. Develop programs on simple if and if-else statement.
7. Develop programs on simple if-else ladder and Nested if-else.
8. Develop programs on Switch case statement.
9. Develop programs on For-loop & Nested For-loop.
10. Develop programs on while and do-while loop.
11. Develop programs on one dimensional array.
12. Develop programs on two dimensional arrays.

Text books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar

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Modern Indian Language

23MILE01	AEC	Marathi	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop the knowledge of local language/mother tongue and relate the same to daily life and social media.
CO2	Make use of rhetoric and verb to form sentences in Marathi Language
CO3	Identity Infinitive compounds in the given Marathi sentence.
CO4	Make use of Phrases and proverbs and form a sentence and Solve Prose Assessment/Summary
CO5	Model a letter to appropriate end user in Marathi Language
CO6	Identity writing type of Marathi stanza and write appropriate writing.

Course Content:

अध्याय 01: भाषा परीचय भाषाआणि व्यक्तिमत्व सहसंबंध, भाषा, जीवन व्यवहार आणि नवमाध्यमे व समाजमाध्यमे, चिन्ह व्यवस्था-विरामचिन्हे, संवाद कौशल्य (तोंडीपरीक्षा), सर्वनाम-पुरुषात्मक, दर्शक, संबंधी, प्रश्नार्थक, सामान्य व आत्मवाचक सर्वनाम, विशेषण-गुणविशेषण, संख्याविशेषण, सार्वनामीक विशेषण	[4]
अध्याय 02: मराठी व्याकरण नाम, सर्वनाम, विशेषणे, क्रियापद, क्रियाविशेषण अव्यय, शब्दयोगी अव्यय, उभयान्वयी अव्यय, केवलप्रयोगी अव्यय, विभक्ती व त्याचेप्रकार, काळ व प्रकार	[4]
अध्याय 03: अलंकार व क्रियापदे **अलंकार-** शब्दलांकर- अनुप्रास, यमक, श्लेष उदाहरणे, अर्थालंकार-उपमा, उत्प्रेक्षा, व्यक्तिरेक, अपदुनती, रूपक, व्यक्तिरेक, अननव्य, अतिशयोक्ती उदाहरणे **प्रयोग**-कर्तरी, कर्मणी, भावे **वाक्यप्रकार**- केवलवाक्य, मिश्रवाक्य, संयुक्तवाक्य **समास**- अव्ययीभाव, तत्पुरुष, द्वंद्व, बहूवृही **क्रियापदे**- कर्तावकर्म, क्रियापदाचे प्रकार- अकर्मक, सकर्मक, उभयविध, संयुक्त, क्रियाविशेषण-कालवाचक, स्थळवाचक, रितीवाचक, संख्यावाचक, प्रश्नार्थक, निषेधार्थक	[4]
अध्याय 04: वाक्प्रचार व म्हणी व गद्यआकलन / सारांशलेखन अर्थ सांगून वाक्यात उपयोग करणे (कमीत कमी ३०वाक्यप्रचार व म्हणी), गद्यआकलन- अपठित गद्य उतारा व त्यावरील प्रश्न उत्तरे (कमीत कमी०५उतारे व त्यावरील प्रश्न उत्तरे),सारांशआकलन	[5]

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अध्याय 05: लेखन प्रकार पत्र लेखन व त्याचे प्रकार-निमंत्रण, आभार, अभिनंदन, मागणी, कोटुंबिक, विनंती, तक्रार संधी -स्वरसंधी, व्यंजनसंधी, विसर्गसंधी, वृत्तलेखन, जाहिरातलेखन, कथालेखन, अहवाललेखन, आवेदनपत्र, अभिप्रायलेखन	[5]
अध्याय 06: कल्पना विस्तार व मुलखात कल्पनाविस्तार, मुलाखतकौशल्ये, मुलाखतीचे वैशिष्ट्ये, मुलाखतीचे स्वरूप, मुलाखत घेताना घ्यावयाची काळजी, मुलाखत देताना आवश्यक बाबी उदा.आत्मविश्वास, व्यक्तिमत्वविकास, भाषा कौशल्ये इ.	[4]

Text books:

1. व्यावहारिक मराठी, डॉ.ल.रा.नसिराबादकर, फडके प्रकाशन, कोल्हापूर.
2. व्यावहारिक मराठी, डॉ.लीला गोविलकर, डॉ.जयश्री पाटणकर, स्नेहवर्धन प्रकाशन, पुणे
3. सुगम मराठी व्याकरणलेखन, मो.रा. वाळंबे, नितीन प्रकाशन पुणे

Reference books:

1. अनिवार्य मराठी व्याकरण, लेखन व आकलन, डॉ. प्रल्हाद लुलेकर, केदार काळवणे, Pearson पब्लिकेशन्स
2. मराठी व इंग्रजी अत्यावश्यक निबंध, प्रा.विजयकुमार वेधपाठक, K'Sagar पब्लिकेशन
3. उपयोजित लेखन, मराठी, प्राची शेंडे, सावली म्हात्रे, टार्गेट पब्लिकेशन्स

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Modern Indian Language

23MILE02	AEC	Hindi	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment –I : 25 Marks Continuous Assessment –II : 25 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop the awareness of Hindi language and relate the same to daily life and social media.
CO2	Identity Infinitive compounds in the given Marathi sentence.
CO3	Make use of Phrases and proverbs and form a sentence in Hindi language.
CO4	Identity the mistakes in grammar of Hindi language and corrections in it
CO5	Make use of rhetoric to form sentences in Hindi Language
CO6	Illustrate the prose and verse in the given literature

Course Content:

अध्याय 01:हिंदीभाषापरीचय हिन्दीभाषाऔरउसकाविकास, हिन्दीसाहित्यकाइतिहास, भाषाकेविभिन्नमौखिकभाषा, लिखितभाषा, रूप-वर्णमाला, विरामचिन्ह, शब्दरचना, अर्थ, वाक्यरचना,वर्णोकाउच्चारणऔरवर्गीकरण	[4]
अध्याय02:समास समास, क्रियाएँ, अनेकार्थीशब्द, विलोमशब्द, पर्यायवाचीशब्द,	[4]
अध्याय 03:मुहावरेएवंलोकोक्ति मुहावरेएवंलोकोक्ति, तत्समएवंतद्भव, देशज, विदेशी, वर्तनी, अर्थबोध	[4]
अध्याय 04:हिन्दीभाषामेंप्रयोगहोनेवालीअशुद्धियाँ हिन्दीभाषामेंप्रयोगहोनेवालीअशुद्धियाँ,अनेकशब्दोंकेलिएएकशब्द, रस	[5]
अध्याय 05:अलंकार अलंकार, छन्द, विशेषणऔरविशेष्य, भाषा-विज्ञान	[5]
अध्याय 06: भाषा-विज्ञान भाषा-विज्ञान, हिन्दीपद्य/गद्यरचनावरचनाकार, संज्ञासेअवयवतक, रिक्तस्थानोंकीपूर्ति, क्रमबद्धता.	[4]

Text books:

1. हिंदीव्याकरण- पंकमताप्रसदगुरु, प्रकाशनसंस्था, नईदिल्ली
2. हिंदी साहित्यिकका विद्ग्नानिक इतिहास-डॉ गणपति चंद्रगुप्त, लोक भारती प्रकाशन, नईदिल्ली.

Reference books:

1. हिंदी भाषा शिक्षण – संपा हिंदी अध्ययन मंडल, सावित्रीबाई फुले पुणे विश्विद्यालय पुणे, राजकमल प्रकाशन

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Open Elective - I

23OECE21	**OE**	**Engineering Management**	**2-0-0**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	Continuous Assessment –I : 10 Marks Continuous Assessment –II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basic management principles to execute managerial activities
CO2	Explain use of various techniques to manage the projects.
CO3	Explain use of project evaluation and review techniques.
CO4	Apply principals of engineering economics.
CO5	Apply resource management techniques.
CO6	Explain new techniques in managements.

Course Content:

Unit 1: Management and planning **Management-** Nature and function of management- Importance ,Definition, management Functions-planning, organizing, directing and controlling , Levels of management, Role of manager, Management skills, Management and administration. Decision Making and decision tree.	[5]
Unit 2: Project Management **Phases of project management:** Bar chart, Gantt chart. Work breakdown structure. CPM network- Time estimates, floats, critical path, Network compression and updating	[5]
Unit3: PERT Introduction, Time estimates, floats, project duration, precedence network.	[5]
Unit 4: Engineering Economics Types of interest, Time value of money, Equivalence. **Economic comparison method:** Present worth method, EUAC method, Capitalized cost method. **Investment criteria:** Net present value , rate of return, Benefit cost ratio, Payback period method, concept of breakeven analysis	[6]
Unit 5: Resource Management: Inventory control, Resource allocation, ABC analysis, EOQ techniques, HML, VED, SDE. Concepts of smoothing and leveling.	[5]

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Unit 6:Emerging trends in Management- Study of project management software. Concept of work study and method study	[4]

Text books:

1. Engineering management by A. K. Gupta, S. Chand Publication.
2. Engineering management – Stoner, Pearson Publication.

Reference books:

1. Industrial Engineering and Management, Dr. O.P. Khanna, Dhanapatay Ray and sons, New Delhi.
2. Work study- Dr. O.P. Khanna, Dhanapatay Ray and sons, New Delhi.
3. Project Planning and control with PERT & CPM- B.C. Punmia, Laxmi Publication.
4. Industrial Engineering and Management, Banga And Sharma, Khanna publications, New Delhi.
5. Financial Management- Prasanna Chandra , TATA McGraw Hill.
6. Industrial Engineering and production Management- Martand Telsang, S. Chand publication.

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Department: Civil Engineering
Class: S.Y. B. Tech

Rev: Course Structure /01/NEP/2023-24
Semester: IV

Course Code	Course Type	Course	Teaching Scheme				Examination Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE2401	PCC	Hydraulics	02	-	-	2	10	10	30	50	100	02
23CE2402	PCC	Surveying-II	03	-	-	3	10	10	30	50	100	03
23CE2403	PCC	Concrete Technology	02	-	-	2	10	10	30	50	100	02
23CE2404	HSSM	Building Planning	01	-	-	1	25	25	-	-	50	01
23CE2405	VEC	Environmental Science	02	-	-	2	25	25	-	-	50	02
23CE2406	PCC	Hydraulics Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2407	PCC	Concrete Technology Laboratory	-	-	02	2	25	25	-	-	50	01
23CE2408	VSEC	Planning Essentials Laboratory	-	-	02	2	25	25	-	-	50	01
23CE2409	EMC	Building Planning Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2410	CEP	Mini Project- III	-	-	02	2	25	25	-	-	50	01
23CEMDXX	MDM	Multidisciplinary Minor-II	03	-	-	3	10	10	30	50	100	03
23OECE22	OE	Open Elective-II	03	-	-	3	10	10	30	50	100	03
23HSSM03	VEC	Aptitude skill- II	01	-	-	1	25	25	-	-	50	01
23HSSM04	VEC	Language skill-II	-	-	02	2	25	25	-	-	50	01
TOTAL			**17**	-	**12**	**29**	**255**	**255**	**150**	**290**	**950**	**23**

Multidisciplinary Minor - II

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Construction Management (23CEMDA2)	Infrastructural Planning and Design (23CEMDB2)	Railway Engineering (23CEMDC2)

***Open Elective course will be offered to students of other programs and will not be offered to students of the same program**

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Hydraulics

23CE2401	**PCC**	**Hydraulics**	**2-0-0**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture: 2hrs/week	Continuous Assessment-I : 10 Marks Continuous Assessment-II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Analyze different physical properties of fluid.
CO2	Explain various forces acting on submerged and floating bodies.
CO3	Distinguish fluid kinematics and fluid dynamics.
CO4	Illustrate flow through pipe
CO5	Illustrate flow through open channels.
CO6	Analyze dimensional homogeneity using Buckinghams theorem

Course Contents:

Unit 1: Properties of Fluids: Introduction to Fluid mechanics, Properties of fluid (density, unit weight, specific surface, surface tension, capillarity), Pascal's law and its applications, Newton's law of viscosity, Classification of fluids	[4]
Unit 2: Fluid Statics: Fluid pressure: Absolute, atmospheric, gauge and vacuum pressures, Pressure head, Pressure measuring devices- Manometers, hydrostatic forces on submerged surfaces (horizontal, vertical surfaces), Buoyancy, Metacentre, metacentric height, equilibrium condition of floating and submerged body	[4]
Unit 3: Fluid Kinematics and Fluid Dynamics: Displacement, velocity and acceleration of fluid particles, Continuity equation, Introduction to: rotational and irrotational flow, velocity potential and stream function flow net, Euler's equation, Bernoulli's equation, practical applications of Bernoulli's theorem	[4]
Unit 4: Flow Through Pipes: Head loss: Concept of major and minor head loss, Darcy-Weisbach equation for determination of major loss, determination of minor losses, pipes connected in series and parallel, concept of equivalent pipe	[4]
Unit 5: Flow Through Open Channels: Hydraulically efficient channel cross sections :(rectangular, trapezoidal, circular) concept of specific energy, Concept of hydraulic jump, subsequent depths, subcritical and supercritical flow in rectangular channels.	[4]

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Unit 6: Dimensional Analysis and Pumps: Dimensional homogeneity, Buckingham's theorem, important dimensional numbers and their significance, geometric, Kinematic, and dynamic similarity, Pumps, types of pumps, efficiency, engineering application of pump	[4]

Text Books

1. Modi, P. N. and S. N. Seth " Hydraulics and Fluid Mechanics", Standard book house, New Delhi, ISBN: 978-81-89401-26-9
2. Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
3. T Bernard Massey and John Ward Smith, "Mechanics of Fluids", Taylor and Francis, 8 Edition (2006) London and New York.
4. Douglas J. F. Gaisorek J. M., Swaffield J. A., "Fluid Mechanics" Addison-Weisley Harlow 1999
5. Shames I. H., " Mehcanics of Fluids", McGraw-Hill, New York 1992.

Reference Books

1. Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
2. Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd New Delhi
3. J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
4. Y.A. Cingel L.M. Oimbala, Fluid Mechanics (S1 Units)", Tata McGraw Hill.
5. R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.

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Surveying-II

23CE2402	PCC	Surveying-II	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs./week	Continuous Assessment-I : 10 Marks Continuous Assessment-II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Surveying-I

Course Outcomes: At the end of the course, students will be able to:

CO1	Experiment with tacheometer to calculate distance and RL as a field data
CO2	Identify systems of triangulation, and procedure involved in it
CO3	Identify procedure in hydrographic, and tunnel survey in collection of the field data
CO4	Summarize steps involved in the curve setting by linear and angular method
CO5	Identify the steps involved in photogrammetry for data collection
CO6	Identify remote sensing, GIS, and GPS technique for collection of field data

Course Content:

Unit 01 : Tacheometric Surveying Significance of tacheometry, suitability, Principle, Tacheometric constant determination, basic formula, anallatic lens, Determination of distance and elevation by stadia and tangential method; numerical problems on both methods	[6]
Unit 02: Triangulation: Principle and classification, system of triangulation, selection of points, use of sub- tense bar for base line measurement, signals and satellite station, concept of reduction to centre, spherical access, concept of tri-lateration	[6]
Unit 03: Hydrographic and Tunnel surveying Terms, hydrographic surveying –sounding equipment, methods –preliminary survey –Tunnel alignment, transfer of ground points.	[5]
Unit 04: Curves Introduction, types of curve, relation between degree of curve and radius, Horizontal curves: setting of curve by linear and angular method, problems on curve setting, Types of Transition and Vertical curves	[7]
Unit 05: Photogrammetry Terms used in photogrammetry and photographs, flight planning, concept of mosaic, concept of stereoscopic fusion, problem on vertical photograph	[6]
Unit 06: Modern methods of surveying Definition, relevance of Remote sensing, components, Electro-magnetic radiation and spectrum, and application in Civil Engineering, GPS –Principle, segment, GPS applications; GIS component, GIS Applications	[6]

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Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune Vidyarthi Griha Prakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

Reference Books

1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Concrete Technology

23CE2403	PCC	Concrete Technology	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2hrs/week	Continuous Assessment-I : 10 Marks Continuous Assessment-II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain knowledge of physical properties of ingredient of concrete and their effect on strength and durability.
CO2	Explain the fundamentals of process of making good quality concrete and its elastic properties.
CO3	Explain the factors affecting properties of concrete.
CO4	Design the concrete mix proportion as per Indian standard code of practice.
CO5	Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete..
CO6	Explain different types of concrete and their applications.

Course Contents:

Unit 1: Ingredient of Concrete **Cement:** Manufacturing process of cement, Chemical composition, grades of cement, hydration, different types of cement, Test for Cement: fineness, standard consistency, setting time, soundness and compressive strength. **Aggregates:** Aggregate characteristics and their significance in strength, workability, placement and compaction of concrete. Specific gravity, bulk density, porosity, absorption of aggregate, moisture content of aggregate, bulking of sand abrasion test, impact value. Alkali aggregate reaction, Artificial and Recycled aggregate	[5]
Unit 2: Workability **Concrete preparation process** – Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing and transportation, placing, methods of compaction, curing, RMC plant. **Properties for fresh concrete** - Factors influence workability, workability test on fresh concrete by slump cone, compaction factor and vee bee consistometer test, segregation and bleeding,	[3]
Unit 3: Hardened concrete Strength of concrete – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage and creep. Non Destructive Testing Rebound hammer, Ultra Sonic Pulse Velocity, Impact echo test	[4]
Unit 4: Concrete Mix Design Mix Design- Process, statistical relation between main and characteristic strength, Factors affecting mix proportions, methods of mix design IS (10262), Acceptance criteria for concrete as per IS specifications, numerical on mix design by ACI 211.1-1991, IS 10262-2009 and IS 456-2000.	[4]
Unit 5: Admixtures in Concrete **Chemical Admixtures:** Plasticizers, super plasticizers, Retarders, Air entraining agents, IS	[4]

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9103Specifications **Mineral Admixtures:** Fly ash, silica fume, GGBS, rice husk ash, metakaolin	
Unit 6: Special Concretes and Durability of concrete **Special Concretes:** Light weight concrete, polymer modified concrete, concept of fibre reinforced concrete, high performance concrete, pumpable concrete, roller compacted concrete, self compacting concrete **Durability of concrete:** Significance, permeability and durability, chemical attack, sulphate attack, attack by seawater, acid attack, chloride attack, and carbonation of concrete	[4]

Text Books

1. Gambhir M. L. " Concrete Technology" , Tata Mc-Graw Hill 2015 15th edition
2. Shetty M. S. "Concrete Technology", S. Chand 2005.
3. Krishnaswamy, " Concrete Technology" , DhanapatRai and Sons

Reference Books

1. Orchard, " Concrete Technology" , Applied Science Publishers
2. Neville A. M., "Concrete Technology" , Pearson Education
3. Neville A. M., " Properties of Concrete" , Pearson Education
4. IS:10262(2009), IS:456 (2009) by Bureau of Indian Standards, New Delhi

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Building Planning

23CE2404	HSSM	Building Planning	1-0-0	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 1 hrs/week	Continuous Assessment-I : 25 Marks Continuous Assessment-II : 25 Marks

Pre-Requisites: Basic Civil Engineering, Introduction to Drawing

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret different building drawings
CO2	Explain principles of planning considering built environment approach
CO3	Apply building rules and byelaws and IS 962:1989 specifications for planning
CO4	Explain methods of perspective drawing for various objects

Course Contents

Unit 1: Conventions and symbols Conventions as per IS 962:1989, symbols for different materials such as earthwork, brickwork, stonework, concrete ,woodwork etc. used in civil engineering construction, graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations .Symbols for room furnishing such as kitchen platform, sink, bed, wardrobe, door opening etc Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing	[3]
Unit 2: Planning of Building and Space Management Principles of planning of Residential and Public building- Aspect, Prospect ,Orientation ,Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation, Economy. Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS962-1989.	[3]
Unit 3: Rules and By Laws by sanctioning authority Rules and bye-laws of sanctioning authorities for construction. Calculation for areas such as plot area, built up area, super built up area, plinth area, carpet area, floor area, FAR (Floor Area Ratio) / FSI	[3]
Unit4: Perspective Drawing Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing. Two Point Perspective of small objects such as steps, monuments, pedestals etc.	[3]

Text Books

1. Building Drawing M.G. Shah, CM Kale, S.Y. Patki Mc Graw Hill
2. Planning and design of Building Y.S. Sane Allied Publishers

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3. Civil Engineering Drawing Malik and Mayo New Asian Publishers
4. Principles of Perspective Drawing M. G. Shah & C. M. Kale Mc Graw Hill
5. Building Planning and Drawing Dr N Kumara Swamy and A Kameshwara Rao Charotar Publication

Reference Books

1. SP-41 (S&T) (1987) ISI Handbook of functional requirements of buildings other than industrial building
2. SP-35 (S&T) (1987) ISI Handbook water supply and drainage with special emphasis on plumbing
3. IS 962- 1989 code of practice for architectural and building drawing
4. IS 1742: 1972 Code of practice for building drainage
5. SP-27 (1987) Handbook of methods of measurements of building works
6. Data book – National Building code, CBRI Publication.
7. Sandeep Mantri , reference book, "A TO Z Practical Building construction and its Management" , Satya Prakashan, New Delhi

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Environmental Science

23CE2405	VEC	Environmental Science	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continuous Assessment-I : 25 Marks Continuous Assessment-II : 25 Marks

Pre-Requisites: -

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain nature of environmental studies
CO2	Explain various natural resources and associated Problems
CO3	Summarize various ecosystems
CO4	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO5	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO6	Interpret the information based on field study and prepare a report.

Course Contents:

Unit 1: Nature of Environmental studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[3]
Unit 2: Natural Resources and Associated Problems **Forest resources:** Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. **Water resources:** Use and over-utilization of surface and ground water, floods, conflicts over water. **Mineral resources:** Usage and exploitation. Environmental effects of extracting and using mineral resources. **Energy resources:** Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. **Land resources:** land degradation; man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	[5]
Unit 3: Ecosystems Concept of an ecosystem, types of ecosystem, structure and function of an ecosystem, producers, consumer and decomposers. Energy flow in the ecosystem, food chain, food web and ecological pyramids, ecological succession. Different types of ecosystem a) Forest ecosystem b)Grassland ecosystem c)Desert ecosystem d)Aquatic ecosystem	[4]
Unit 4: Biodiversity Introduction-Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Western Ghat as a biodiversity region Hot spot of biodiversity. Threats to biodiversity, man and wildlife conflicts. Conservation of biodiversity. In-situ conservation and Ex-situ conservation.	[4]
Unit 5: Environmental Pollution and Environmental Protection Definition: Causes, effects and control measures of various types of pollution. Solid waste	[4]

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Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development : From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of pollution) Act. Water (Prevention and Control of pollution)Act. Forest conservation Act. Wildlife Protection Act. Human Rights.	
Unit 6: Field work Visit to a local area to document Environmental assets-River ,Forest ,Grassland Visit to local polluted site Study of common plants, insects, birds Study of ecosystem river, ponds etc	[4]

Text Books :

1. P. N. Wartikar & amp; J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune.
2. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.

Reference Books:

1.C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

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Hydraulics Laboratory

23CE2406	PCC	Hydraulics Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	Continuous Assessment-I : 15 Marks Continuous Assessment-II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine pressure of fluid
CO2	Identify type of flow through pipe and verification of Bernoulli's theorem
CO3	Experiment with calibrations of various flow measuring devices
CO4	Illustrate losses occurred in pipe flow

All experiments are compulsory

List of Experiments:

1. Study of pressure measuring devices
2. Study of stability of floating bodies
3. Study of flow in Reynolds apparatus
4. Verification of Bernoulli's theorem
5. Calibration of Venturimeter
6. Calibration of Orifice meter
7. Calibration of rectangular notch
8. Calibration of triangular notch
9. Study of major losses in pipe
10. Study of minor losses in pipe

Text Books

1. Modi, P. N. and S. N. Seth " Hydraulics and Fluid Mechanics", Standard book house, New Delhi, ISBN: 978-81-89401-26-9
2. Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
3. T Bernard Massey and John Ward Smith, "Mechanics of Fluids", Taylor and Francis, 8 Edition (2006) London and New York.
4. Douglas J. F. Gaisorek J. M., Swaffield J. A., "Fluid Mechanics" Addison-Weisley Harlow 1999
5. Shames I. H., " Mehcanics of Fluids", McGraw-Hill, New York 1992.

Reference Books

1. Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
2. Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd New Delhi
3. J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
4. Y.A. Cingel L.M. Oimbala, Fluid Mechanics (S1 Units)", Tata McGraw Hill.
5. R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.

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Concrete Technology Laboratory

23CE2407	**PCC**	**Concrete Technology Laboratory**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	Continuous Assessment-I : 25 Marks Continuous Assessment-II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine the quality of ingredients of concrete as per IS codes.
CO2	Design a concrete mix as per the requirement at the field using various codes.
CO3	Asses the suitability of NDT methods on field.
CO4	Apply compressive strength of concrete cubes

All experiments are compulsory

Part I

Test in Lab

1. To determine fineness of cement by Sieve analysis
2. To determine the standard consistency of cement using Vicat's apparatus.
3. To determine initial and final setting time of cement.
4. Determination of soundness of cement by Le- Chatelier's apparatus and/or Auto Clave test.
5. To determine compressive strength of cement.
6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate).
7. Determination of specific gravity of fine aggregates.
8. Determination of specific gravity and water absorption of coarse aggregates.
9. To determine flakiness and elongation index of coarse aggregates.
10. To determine workability of fresh concrete by using slump cone and/or Vee Bee consistometer.
11. To determine compaction factor for workability of fresh concrete.
12. Nondestructive test on concrete by: Rebound Hammer Test, Ultrasonic Pulse Velocity Test.
13. Tests for compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262-2009 and IS 456 2000).

Part II

Site Visit

1. NDT Project (using rebound hammer and ultrasonic pulse velocity tests) on any site with a short report.
2. Site visit to study advances in Concrete Technology (like RMC, Pumped concrete etc.) with a short report.

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Text Books

1. Gambhir M. L. " Concrete Technology" , Tata Mc-Graw Hill 2015 15th edition
2. Shetty M. S. "Concrete Technology", S. Chand 2005.
3. Krishnaswamy, " Concrete Technology" , DhanapatRai and Sons

Reference Books

1. Orchard, " Concrete Technology" , Applied Science Publishers
2. Neville A. M., "Concrete Technology" , Pearson Education
3. Neville A. M., " Properties of Concrete" , Pearson Education
4. IS:10262(2009), IS:456 (2009) by Bureau of Indian Standards, New Delhi

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Planning Essentials Laboratory

23CE2408	VSEC	Planning Essentials Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	Continuous Assessment-I : 25 Marks Continuous Assessment-II : 25 Marks

Course Outcomes: At the end of the course, students will be able to

CO1	Determination of horizontal distance and elevation of point using Tacheometer an its application in Civil Engineering
CO2	Determine and apply the data necessary for curve setting
CO3	Demonstrate use of leveling instrument for RL determination, and its use to prepare the contour map
CO4	Draw plan and sectional view of road from field measurement, and estimate the quantity of earthwork from field measurement /software

All experiments and projects are compulsory

Part-I

List of Experiments

1. Experiment on determination of tacheometric constants
2. Experiment on finding the gradient of line
3. Experimental planning to find the area of polygon
4. Experiment on total station traversing
5. Experiment on Curve setting by linear method
6. Experiment on Curve setting by angular method
7. Experiment on Setting of transition curve
8. Experiment on length calculation from GPS co-ordinates
9. Preparation of report on Topographic map
10. Demonstration of software in surveying

Part-II

Projects

1. Road Project: 300 m -600 m
2. Radial Contouring

Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune Vidyarthi Griha Prakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

Reference Books

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1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Building Planning Laboratory

23CE2409	**EMC**	**Building Planning Laboratory**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical :2 hrs/week	Continuous Assessment-I : 15 Marks Continuous Assessment-II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to

CO1	Identify the required space for planning.
CO2	Gain a broad understanding of planning of public buildings as per the requirements.
CO3	Prepare the drawing for building in a professional set up.
CO4	Draw perspective drawing for a building object.

All experiments are compulsory

List of Experiments:

A. Draw to a suitable scale on Full Imperial Drawing Sheet

A1.Human Body figures and its application in space design

A2. Draw line plan for Any FIVE type of Public Buildings.

- Primary Health Center.
- School Building.
- Head Post Office.
- Bank.
- Super specialty Hospital.
- Commercial mall.
- Railway station.
- Bus Station

B. Drawing to a scale on Full Imperial Drawing Sheet

B1. Planning & design of a building (Minimum G+1) drawings for Municipal submission drawing which contents:-

- All Floor Plans
- Minimum one Section passing through WC/Staircase
- Minimum one elevation
- Site plan (Water Supply and Sewer line)
- Key Plan
- North Direction
- Construction Notes
- Schedule of Openings
- Area Statement
- Project Title.

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B2. Prepare detailed working drawing of Experiment no B1 Each sheet should be separate of the following.

- Foundation / Center Line drawing.
- Staircase design and detail drawing.
- Electrical layout drawing.
- Furniture layout drawing.
- Plumbing and Water Supply Drawing.

B3. Two Point Perspective drawings for any object like steps…..

Note: Students should be visited minimum five sites to existing or ongoing public building.

Text Books:

1. Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
2. Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
3. Jain A.K., The Idea of Green Building Khanna Publishers, N. Dehli,
4. V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
5. N. Kumara Swamy and A. Kameswara Rao,"Building Planning and Drawing", 8th Edition, Charotar Publications, 2010.

Reference Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
3. I.S. 962 – 1989 Code for Practice for Architectural and Building

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Mini Project

23CE2410	CEP	Mini Project- III	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2hrs/week	Continuous Assessment-I : 25 Marks Continuous Assessment-II : 25 Marks

Pre-Requisites: Mini Project-I, Mini Project II

About Ideathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Content:

Week 1:Survey Design-1 • Ensure case study group students have made necessary communication and done a preparatory visit. • Watch the lecture on survey design and study the notes. • Prepare a questionnaire and try it out with your group members as mock.	[2]
Week 2: Survey Design-2 • Review survey questionnaire prepared by case study groups. • Decide sampling strategy. • Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork • Data Collection:Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). • Use data collection tools like questionnaires, observation checklists, and digital analytics. • Ensure data accuracy and reliability through proper sampling and recording methods.	[2]

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Week 4: Trails and Experimentation-1 • Initial Setup and Configuration • Concept Validation • Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 • Prototyping • Functionality Testing	[2]
Week 6: Trails and Experimentation-3 • Bug Identification and Fixing • Integration Testing • Security Testing • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results • Coordinator has to check and verify below points in term of result: • Functional Performance • Accuracy and Precision • Efficiency • Safety	[2]
Week 8: Validation • Coordinator has to check and verify below points in term of validation: • Testing and Verification • Compliancewith Standards	[2]
Week 9: Integration Testing • Validate that the hardware integrates seamlessly with other systems or components as intended • Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10:Documentation and Reporting • Maintain comprehensive documentation of design, development, testing, and validation processes • Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation • 100% Presentation has to be conducted by mentor/guide based on above activity. • Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition • Mini project exhibition will be schedule with interdepartmental evaluation.	[2]

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MDM - II

23CEMDA2	MDM	Construction Management	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:	
Lecture: 3hrs/week	Continuous Assessment-I	:10 Marks
	Continuous Assessment-II	:10 Marks
	Mid Semester Exam	: 30 Marks
	End Semester Exam	: 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance
Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the concepts of construction management and construction theories
CO2	Apply the management principles and planning
CO3	Analyze the process of project management and organization of management
CO4	Develop the schedule of activities in a construction project.
CO5	Apply management principles in construction management
CO6	Develop the concepts of construction site management

Course Contents:

Unit 1: Introduction Introduction to Construction management, Major problems in Construction Industry, History of Construction Management, Evolution of management thoughts& theories of F.W. Taylor, Henri Fayol, Max Weber, etc., SWOT Analysis in construction	[5]
Unit 2: Management Planning Management planning and principles, importance of planning, Nature and purpose of planning, planning process, types of planning, objectives, setting objectives, planning premises, strategic management	[5]
Unit 3: Project Management Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Organization of management, Organizational Hierarchy, types of organizations	[8]
Unit 4: Project Management through network Critical path method, early and late time calculations, Float, critical path, resource allocation, network compression. Programme evaluation & review technique (PERT), expected times and slack, probability of completion time of a project, construction safety standards.	[6]
Unit 5: Construction management Management Information and Control Systems, Communication, System Concepts, Need for Management Information, Design of Management Information Systems, Value of Information,	[6]

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Management Information Systems in Construction Industry.	
Unit 6: Construction site Management: Site mobilization-demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers ,Engineers , Supervisors.	[5]

Text Books

1. S. Seetharaman. Construction Engineering and Management. Umesh Publication. 2. R L Peurifoy, C J Schexnayder, A. Shapira. Construction planning, equipment and methods. Mc Graw Hill Education (India).
2. Knutson, K, Schexnayder, C J, Fiori, C. and Mayo, R E (2013) Construction Management, Fundamentals, MCGraw Hill Publishers.

Reference Books

1. CPWD Works Manual. 2019, Nirman Bhawan, New Delhi.
2. Standard operating procedure for CPWD Works Manual, 2019, Nirman Bhawan, New Delhi.
3. Fewings, P (2011) Construction Project Management - An integrated approach, Taylor and Francis.
4. Goetsch, D L (2015) Project Management for construction, Pearson publishers.
5. Ottoson, H (2013) Practical project management for building and construction, CRCPress, Taylor and Francis.

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MDM - II

23CEMDB2	MDM	Infrastructural Planning and Design	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:	
Lecture: 3hrs/week	Continuous Assessment-I	:10 Marks
	Continuous Assessment-II	:10 Marks
	Mid Semester Exam	: 30 Marks
	End Semester Exam	: 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain concepts related to infrastructure
CO2	Apply infrastructure economics and finance
CO3	Interpret challenges to successful infrastructure planning
CO4	Make use of policies and regulatory frameworks
CO5	Utilize phases and players in infrastructure planning and managements
CO6	Develop the design for infrastructure service life

Course Contents:

Unit 1: Basic Concepts Related To Infrastructure Introduction to Infrastructure, an overview of the Power Sector in India, Water Supply and Sanitation Sector in India, Road, Rail, Air and Port Transportation Sectors in India, Telecommunications Sector in India, Urban Infrastructure in India, Rural Infrastructure in India, an Introduction to Special Economic Zones.	[6]
Unit 2: Infrastructure Economics And Finance Principles of Finance, Infrastructure Economics, Developing Financial Models for Infrastructure, Introduction to Project Finance.	[6]
Unit 3: Challenges To Successful Infrastructure Planning Risks and Challenges in Infrastructure, Introduction to Social Environmental Risk in Infrastructure, Economic Risk in Infrastructure, Political Risk in Infrastructure.	[6]
Unit 4: Policy And Regulatory Frameworks Government policies and initiatives for infrastructure development, Regulatory bodies and their roles in infrastructure planning and design, Public-private partnerships (PPP) in infrastructure projects.	[6]
Unit 5: Phases And Players In Infrastructure Planning And Managements Introduction to the Infrastructure Process, Description of Stages, Project Lifecycle, Construction, Operation and Maintenance of Infrastructure, Infrastructure Players.	[6]
Unit 6: Design For Infrastructure Service Life Introduction to Design concepts, Design technology framework, design requirements, design phase, design constraints, Case study.	[6]

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Text Books

1. Verma S.P. ed. "Infrastructure in India's Development: Power, Transport and Communication", Institute of Public Administration, New Delhi, 2004.

Reference Books

1. Goodman, Alvin S. and Makarand Hastak. Infrastructure Planning Handbook: 2006.
2. Revelle, C.S., Whitlatch, E.E. and Wright, J.R. Civil and Environmental Systems Engineering; Prentice Hall, 2004.
3. Hudson W. and Ralph H. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation, Tata Mc Graw Hills.
4. The India Infrastructure Report, Ministry of Finance, Govt. of India.

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MDM - II

23CEMDC2	MDM	Railway Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:	
Lecture: 3hrs/week	Continuous Assessment-I	:10 Marks
	Continuous Assessment-II	:10 Marks
	Mid Semester Exam	: 30 Marks
	End Semester Exam	: 50 Marks

Pre-Requisites: Surveying I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the knowledge on elements of permanent way in Railways, selection of gauges, route alignment surveys.
CO2	Apply the knowledge of hauling capacity, stresses in rails, ballast, sleepers, joints in rails.
CO3	Explain Flash-Butt weld, Short Welded Rail, Creep in Rails, Buckling of Rails,Cant excess, cant deficiency, Transition curves, Widening at curve.
CO4	Identify turnouts its types and Design, Crossings, Track Junctions and Design; Signals, Types of signals, Signal placements, Interlocking of tracks.
CO5	Explain track maintenance, drainage of track, high-speed rails.
CO6	Explain Location and layout of stations and yards, role of Indian Railways in Nation development, EIA.

Course Contents:

Unit 1: Introduction History of Railway, Indian Railways, Development of Indian Railways, Railway Survey, Reconnaissance Survey, Preliminary Survey, Location Survey, Construction of new Railway Line	[6]
Unit 2: Train Resistance And Rail Gauges Train Resistances, Rolling Stock, Locomotives, Coaches, Wagons, Train Brakes, Gauges, Gauges in different countries, Uniformity in gauges, Permanent Way and its requirement, Functions of rails, Types of rails, Sections of Rails	[6]
Unit 3: Railway Planning And Construction Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage- Level Crossings-Signaling.	[6]
Unit 4: Welding And Curves In Railway Long Welded Rails, Continuous Welded Rails, Fastenings for Rails-to-Rail, Fastenings for Rail-to-Sleeper, Track Alignment – Need, Requirements, Selection factors. Speed on track – Safe, Permissible, Equilibrium, Cant excess, cant deficiency, Transition curves, Widening at curve, clearances, Gradients.EIA in Railways and case studies.	[6]
Unit 5: Interlocking Turnouts – Types and Design, Crossings – Types and Design. Track Junctions and Design; Signals	[8]

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– Classification and functions, Types of signals, Signal placements; Interlocking of tracks – Standards, Principles, Isolation. Interlocking on tracks: Key, Mechanical, Route Reply, Electrical, Electronic interlocking; Train Control Systems: Block and non-block systems; Railway stations – Types, Yards, Level crossings.	
Unit 6: Maintenance Of Tracks General, Necessity for maintenance of track, Maintenance of railway bridges, Signaling during maintenance, Rail Inspection, Track Inspection, Drainage of Tracks – surface and subsurface.	**[4]**

Text Books

1. Railway Engineering, Rangwala, Charotar Publishing House Pvt Limited.
2. Rail Engineering by S. Chandra , Arora & Saxena

Reference Books

1. Basic of Track Structure and Components, Indian Railways Center for Advanced Maintenance Technologies, IRCAMT, Maharajpur, Gwalior, 2023
2. Basics of Railway Signal Engineering by G V Rao, ITD-2, Indian Railways Institute of Signal Engineering and Telecommunication, IRISET, Secundrabad
3. Handbook on welding techniques, Indian Railways Center for Advanced maintenance Technologies, IRCAMT, Maharajpur, Gwalior
4. India's Bullet Train Ride- The Journey so far, National High Speed Rail Corporation Limited, 2023
5. Indian Railway Maintenance Manual (Works)
6. Indian Railway Standard Specification for 10 mm thick Composite Grooved Rubber Sole Plates for placing beneath rails, M&C Directorate, RDSO, Lucknow, 2020

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Aptitude Skill-II (Numerical Ability)

23HSSM01	VEC	Aptitude Skills- II	1-0-0	1 Credit

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Pre-Requisites: Basic Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
CO2	Solve questions based on Number system
CO3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
CO4	Solve questions based on Profit & Loss and mensurations.

Course Content:

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	[3]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[3]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership **Speed- Time- Distance** Speed, Time, and Distance, Trains, Boats, Streams, Races	[3]
Unit 4: Business Aptitude Profit & Loss, Simple Interest, Compound Interest **Geometry and Venn Diagram** 2D and 3D Mensuration, Venn diagram	[3]

Text books:

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition

Reference books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar

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Language Skill- II

23HSSM02	**VEC**	**Language Skill- II**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Pre-Requisites: Language Skill- I

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using Functions.
CO2	Make use of Structures & Union to develop programs in C language
CO3	Make use of Pointers to develop programs in C language
CO4	Develop programs to perform various operations on files using File Handling.

Course Content:

1. Develop programs on using different built-in functions.
2. Develop programs on using function without argument and without return category.
3. Develop programs on using function with argument and without return category.
4. Develop programs on using function without argument and with return category.
5. Develop programs on using function with argument and with return category.
6. Develop programs using more than one used defined functions.
7. Develop programs on recursion.
8. Develop programs on Structure using various entities and size of structure.
9. Develop programs on array of structure.
10. Develop programs on structures and functions and compare structure and union.
11. Develop programs to display different data type of data and their addresses using pointer
12. Develop programs on pointer to array, pointer to structure, pointer to functions and pointer expressions.
13. Develop program to read, write and append data from a file.

Text books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar

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Open Elective -II

23OECE22	OE	Air and Noise Pollution Control	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:	
Lecture: 3hrs/week	Continuous Assessment-I	:10 Marks
	Continuous Assessment-II	:10 Marks
	Mid Semester Exam	: 30 Marks
	End Semester Exam	: 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the atmosphere & amp; meteorology and its importance in Air Pollution
CO2	Estimate air pollutant concentration and understand different norms of air quality
CO3	Explain effect of air pollutants on environment
CO4	Explain different air pollution control measures
CO5	Explain effects of noise on human, animals and plants
CO6	Summarize the various techniques of noise measurement and control for community and industries sources

Course Contents:

Unit 1: Introduction to Air Pollution Atmosphere-Structure and Composition, Definition of air pollution, Stationary and mobile sources of air pollutants, Types of air pollutants- according to origin, chemical composition and state of matter.	[5]
Unit 2: Effect of air pollutant Effects of Air Pollution on human, vegetation, Animals; Acid rain, Global Warming, Climate Change and Greenhouse Effect, Ozone Layer Depletion, air pollution episodes. Air pollution Case study- London smog, Bhopal gas tragedy	[7]
Unit 3: Air Sampling and Analysis Units of measurement of air pollution, Study of Settling Chamber, High Volume Air Sampler (HVAS), Air quality index with numerical, ambient air quality monitoring as per CPCB.	[6]
Unit 4: Air pollution control measures Plume and its behavior, stack height, Introduction to air pollution control instruments- Scrubbers, Electrostatic precipitators (ESPs), air filters and cyclones, air pollution control strategy in India.	[6]
Unit 5: Introduction to Noise pollution Engineering definition of noise and sound, Properties of sound- sound power, sound intensity, sound pressure level, sources and types of noise, effects of noise on human health and wild life.	[6]
Unit 6: Industrial noise –sources and health monitoring Noise monitoring in industries, Noise indices, Industrial materials and methods to control noise pollution, control of noise- at source, along path and at receiving end, Noise Pollution(Regulation and Control) rules2020.	[6]

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Text Books

1. "Air Pollution" by Wark K. and Warner C. F. (H. R. Publication).
2. "Air Pollution Vol. I and II" by Stern A. C. (Allied Publishers Limited).
3. "Air Pollution" Rao H.V.N. and Rao M. N., Tata (McGraw Hill).
4. IS code for practice for noise reduction in industrial buildings IS: 3483, 1965.

Reference Books

1. "Air Pollution Control Engineering" by Noel de Nevers (Waveland Press, Inc.).
2. "An Introduction to Air pollution" by R.K. Trivedi and P. K. Goel (B. S. Publications).
3. "Noise Pollution" by S.K. Agarwal, (APH Publishing Corporation, New Delhi. New Delhi).

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Department: Department of Civil Engineering **Rev:** Course Structure /01/NEP/2023-24
Class: S.Y. B. Tech **Semester:** IV

Course Code	Type of Course	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE2401	PCC	Hydraulics	02	-	-	2	10	10	30	50	100	02
23CE2402	PCC	Surveying-II	03	-	-	3	10	10	30	50	100	03
23CE2403	PCC	Concrete Technology	02	-	-	2	10	10	30	50	100	02
23CE2404	HSSM	Building Planning	01	-	-	1	25	25	-	-	50	01
23CE2405	VEC	Environmental Science	02	-	-	2	25	25	-	-	50	02
23CE2406	PCC	Hydraulics Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2407	PCC	Concrete Technology Laboratory	-	-	02	2	25	25	-	-	50	01
23CE2408	VSEC	Planning Essentials Laboratory	-	-	02	2	25	25	-	-	50	01
23CE2409	EMC	Building Planning Laboratory	-	-	02	2	15	15	-	20	50	01
23CE2410	ELC	Mini Project- III	-	-	02	2	25	25	-	-	50	01
23CEMDXX	MDM	Multidisciplinary Minor-II	03	-	-	3	10	10	30	50	100	03
23OECE22	OE	Open Elective-II	03	-	-	3	10	10	30	50	100	03
23HSSM03	VEC	Aptitude skill- II	01	-	-	1	25	25	-	-	50	01
23HSSM04	VEC	Language skill-II	-	-	02	2	25	25	-	-	50	01
TOTAL			**17**	**-**	**12**	**29**	**255**	**255**	**150**	**290**	**950**	**23**

Multidisciplinary Minor - II

Infrastructure Engineering	Architectural Aspect	Transportation Engineering
Construction Management (23CEMDA2)	Infrastructural Planning and Design (23CEMDB2)	Railway Engineering (23CEMDC2)

Open Elective-II

Air and Noise Pollution Control

***Open Elective course will be offered to students of other programs and will not be offered to students of the same program**

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Hydraulics

23CE2401	**PCC**	**Hydraulics**	**2-0-0**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture: 2hrs/week	CA-I : 10 Marks CA-II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Analyze different physical properties of fluid.
CO2	Explain various forces acting on submerged and floating bodies.
CO3	Distinguish fluid kinematics and fluid dynamics.
CO4	Illustrate flow through pipe
CO5	Illustrate flow through open channels.
CO6	Analyze dimensional homogeneity using Buckinghams theorem

Course Contents

Unit 1: Properties of Fluids: Introduction to Fluid mechanics, Properties of fluid (density, unit weight, specific surface, surface tension, capillarity), Pascal's law and its applications, Newton's law of viscosity, Classification of fluids	**[4]**
Unit 2: Fluid Statics: Fluid pressure: Absolute, atmospheric, gauge and vacuum pressures, Pressure head, Pressure measuring devices- Manometers, hydrostatic forces on submerged surfaces (horizontal, vertical surfaces), Buoyancy, Metacentre, metacentric height, equilibrium condition of floating and submerged body	**[4]**
Unit 3: Fluid Kinematics and Fluid Dynamics: Displacement, velocity and acceleration of fluid particles, Continuity equation, Introduction to: rotational and irrotational flow, velocity potential and stream function flow net, Euler's equation, Bernoulli's equation, practical applications of Bernoulli's theorem	**[4]**
Unit 4: Flow Through Pipes: Head loss: Concept of major and minor head loss, Darcy-Weisbach equation for determination of major loss, determination of minor losses, pipes connected in series and parallel, concept of equivalent pipe	**[4]**
Unit 5: Flow Through Open Channels: Hydraulically efficient channel cross sections :(rectangular, trapezoidal, circular) concept of specific energy, Concept of hydraulic jump, subsequent depths, subcritical and supercritical flow in rectangular channels.	**[4]**

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Unit 6: Dimensional Analysis and Pumps: Dimensional homogeneity, Buckingham's theorem, important dimensional numbers and their significance, geometric, Kinematic, and dynamic similarity, Pumps, types of pumps, efficiency, engineering application of pump	[4]

Text Books

1. Modi, P. N. and S. N. Seth " Hydraulics and Fluid Mechanics", Standard book house, New Delhi, ISBN: 978-81-89401-26-9
2. Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
3. T Bernard Massey and John Ward Smith, "Mechanics of Fluids", Taylor and Francis, 8 Edition (2006) London and New York.
4. Douglas J. F. Gaisorek J. M., Swaffield J. A., "Fluid Mechanics" Addison-Weisley Harlow 1999
5. Shames I. H., " Mehcanics of Fluids", McGraw-Hill, New York 1992.

Reference Books

1. Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
2. Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd New Delhi
3. J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
4. Y.A. Cingel L.M. Oimbala, Fluid Mechanics (S1 Units)", Tata McGraw Hill.
5. R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.

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Surveying-II

23CE2402	PCC	Surveying-II	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs./week	CA-I : 10 Marks CA-II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Surveying-I

Course Outcomes: At the end of the course, students will be able to:

CO1	Experiment with tacheometer to calculate distance and RL as a field data
CO2	Identify systems of triangulation, and procedure involved in it
CO3	Identify procedure in hydrographic, and tunnel survey in collection of the field data
CO4	Summarize steps involved in the curve setting by linear and angular method
CO5	Identify the steps involved in photogrammetry for data collection
CO6	Identify remote sensing, GIS, and GPS technique for collection of field data

Course Content

Unit 01 : Tacheometric Surveying Significance of tacheometry, suitability, Principle, Tacheometric constant determination, basic formula, anallatic lens, Determination of distance and elevation by stadia and tangential method; numerical problems on both methods	[6]
Unit 02: Triangulation: Principle and classification, system of triangulation, selection of points, use of sub- tense bar for base line measurement, signals and satellite station, concept of reduction to centre, spherical access, concept of tri-lateration	[6]
Unit 03: Hydrographic and Tunnel surveying Terms, hydrographic surveying –sounding equipment, methods –preliminary survey –Tunnel alignment, transfer of ground points.	[5]
Unit 04: Curves Introduction, types of curve, relation between degree of curve and radius ,Horizontal curves: setting of curve by linear and angular method, problems on curve setting , Types of Transition and Vertical curves	[7]
Unit 05: Photogrammetry Terms used in photogrammetry and photographs, flight planning, concept of mosaic, concept of stereoscopic fusion, problem on vertical photograph	[6]
Unit 06: Modern methods of surveying Definition, relevance of Remote sensing,components, Electro-magnetic radiation and spectrum ,and application in Civil Engineering ,GPS –Principle, segment, GPS applications; GIS component, GIS Applications	[6]

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Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune Vidyarthi Griha Prakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

Reference Books

1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Concrete Technology

23CE2403	PCC	Concrete Technology	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 2hrs/week	CA- I :10 Marks CA- II :10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain knowledge of physical properties of ingredient of concrete and their effect on strength and durability.
CO2	Explain the fundamentals of process of making good quality concrete and its elastic properties.
CO3	Explain the factors affecting properties of concrete.
CO4	Design the concrete mix proportion as per Indian standard code of practice.
CO5	Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete..
CO6	Explain different types of concrete and their applications.

Course Contents

Unit 1: Ingredient of Concrete **Cement:** Manufacturing process of cement, Chemical composition, grades of cement, hydration, different types of cement, Test for Cement: fineness, standard consistency, setting time, soundness and compressive strength. **Aggregates:** Aggregate characteristics and their significance in strength, workability, placement and compaction of concrete. Specific gravity, bulk density, porosity, absorption of aggregate, moisture content of aggregate, bulking of sand abrasion test, impact value. Alkali aggregate reaction, Artificial and Recycled aggregate	[5]
Unit 2: Workability **Concrete preparation process** – Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing and transportation, placing, methods of compaction, curing, RMC plant. **Properties for fresh concrete** - Factors influence workability, workability test on fresh concrete by slump cone, compaction factor and vee bee consistometer test, segregation and bleeding,	[3]
Unit 3: Hardened concrete Strength of concrete – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage and creep. Non Destructive Testing Rebound hammer, Ultra Sonic Pulse Velocity, Impact echo test	[4]
Unit 4: Concrete Mix Design Mix Design- Process, statistical relation between main and characteristic strength, Factors affecting mix proportions, methods of mix design IS (10262), Acceptance criteria for concrete as per IS specifications, numerical on mix design by ACI 211.1-1991, IS 10262-2009 and IS 456-2000.	[4]
Unit 5: Admixtures in Concrete **Chemical Admixtures:** Plasticizers, super plasticizers, Retarders, Air entraining agents, IS	[4]

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9103Specifications **Mineral Admixtures:** Fly ash, silica fume, GGBS, rice husk ash, metakaolin	
Unit 6: Special Concretes and Durability of concrete **Special Concretes:** Light weight concrete, polymer modified concrete, concept of fibre reinforced concrete, high performance concrete, pumpable concrete, roller compacted concrete, self compacting concrete **Durability of concrete:** Significance, permeability and durability, chemical attack, sulphate attack, attack by seawater, acid attack, chloride attack, and carbonation of concrete	[4]

Text Books

1. Gambhir M. L. " Concrete Technology" , Tata Mc-Graw Hill 2015 15th edition
2. Shetty M. S. "Concrete Technology", S. Chand 2005.
3. Krishnaswamy, " Concrete Technology" , DhanapatRai and Sons

Reference Books

1. Orchard, " Concrete Technology" , Applied Science Publishers
2. Neville A. M., "Concrete Technology" , Pearson Education
3. Neville A. M., " Properties of Concrete" , Pearson Education
4. IS:10262(2009), IS:456 (2009) by Bureau of Indian Standards, New Delhi

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Building Planning

23CE2404	**HSSM**	**Building Planning**	**1-0-0**	**1 Credits**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Pre-Requisites: Basic Civil Engineering, Introduction to Drawing

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret different building drawings
CO2	Explain principles of planning considering built environment approach
CO3	Apply building rules and byelaws and IS 962:1989 specifications for planning
CO4	Explain methods of perspective drawing for various objects

Course Contents

Unit 1: Conventions and symbols Conventions as per IS 962:1989, symbols for different materials such as earthwork, brickwork, stonework, concrete ,woodwork etc. used in civil engineering construction, graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations .Symbols for room furnishing such as kitchen platform, sink, bed, wardrobe, door opening etc Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing	[3]
Unit 2: Planning of Building and Space Management Principles of planning of Residential and Public building- Aspect, Prospect ,Orientation ,Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation, Economy. Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS962-1989.	[3]
Unit 3: Rules and By Laws by sanctioning authority Rules and bye-laws of sanctioning authorities for construction. Calculation for areas such as plot area, built up area, super built up area, plinth area, carpet area, floor area, FAR (Floor Area Ratio) / FSI	[3]
Unit4: Perspective Drawing Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing. Two Point Perspective of small objects such as steps, monuments, pedestals etc.	[3]

Text Books

1. Building Drawing M.G. Shah, CM Kale, S.Y. Patki Mc Graw Hill
2. Planning and design of Building Y.S. Sane Allied Publishers

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3. Civil Engineering Drawing Malik and Mayo New Asian Publishers
4. Principles of Perspective Drawing M. G. Shah & C. M. Kale Mc Graw Hill
5. Building Planning and Drawing Dr N Kumara Swamy and A Kameshwara Rao Charotar Publication

Reference Books

1. SP-41 (S&T) (1987) ISI Handbook of functional requirements of buildings other than industrial building
2. SP-35 (S&T) (1987) ISI Handbook water supply and drainage with special emphasis on plumbing
3. IS 962- 1989 code of practice for architectural and building drawing
4. IS 1742: 1972 Code of practice for building drainage
5. SP-27 (1987) Handbook of methods of measurements of building works
6. Data book – National Building code, CBRI Publication.
7. Sandeep Mantri , reference book, "A TO Z Practical Building construction and its Management" , Satya Prakashan, New Delhi

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Environmental Science

23CE2405	**VEC**	**Environmental Science**	**2-0-0**	**2 Credit**

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain nature of environmental studies
CO2	Explain various natural resources and associated Problems
CO3	Summarize various ecosystems
CO4	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO5	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO6	Interpret the information based on field study and prepare a report.

Course Contents

Unit 1: Nature of Environmental studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[3]
Unit 2: Natural Resources and Associated Problems **Forest resources:** Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. **Water resources:** Use and over-utilization of surface and ground water, floods, conflicts over water. **Mineral resources:** Usage and exploitation. Environmental effects of extracting and using mineral resources. **Energy resources:** Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. **Land resources:** land degradation; man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	[5]
Unit 3: Ecosystems Concept of an ecosystem, types of ecosystem, structure and function of an ecosystem, producers, consumer and decomposers. Energy flow in the ecosystem, food chain, food web and ecological pyramids, ecological succession. Different types of ecosystem a) Forest ecosystem b)Grassland ecosystem c)Desert ecosystem d)Aquatic ecosystem	[4]
Unit 4: Biodiversity Introduction-Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Western Ghat as a biodiversity region Hot spot of biodiversity. Threats to biodiversity, man and wildlife conflicts. Conservation of biodiversity. In-situ conservation and Ex-situ conservation.	[4]
Unit 5: Environmental Pollution and Environmental Protection Definition: Causes, effects and control measures of various types of pollution. Solid waste	[4]

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Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development : From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of pollution) Act. Water (Prevention and Control of pollution)Act. Forest conservation Act. Wildlife Protection Act. Human Rights.	
Unit 6: Field work Visit to a local area to document Environmental assets-River ,Forest ,Grassland Visit to local polluted site Study of common plants, insects, birds Study of ecosystem river, ponds etc	**[4]**

Text Books :

1. P. N. Wartikar & amp; J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune.
2. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.

Reference Books:

1.C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

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Hydraulics Laboratory

23CE2406	PCC	Hydraulics Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hr/week	CA-I : 25 Marks CA-II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine pressure of fluid
CO2	Identify type of flow through pipe and verification of Bernoulli's theorem
CO3	Experiment with calibrations of various flow measuring devices
CO4	Illustrate losses occurred in pipe flow

All experiments are compulsory

List of Experiments:

1.Study of pressure measuring devices
2. Study of stability of floating bodies
3. Study of flow in Reynolds apparatus
4. Verification of Bernoulli's theorem
5. Calibration of Venturimeter
6.Calibration of Orifice meter
7. Calibration of rectangular notch
8. Calibration of triangular notch
9.Study of major losses in pipe
10. Study of minor losses in pipe

Text Books

1. Modi, P. N. and S. N. Seth " Hydraulics and Fluid Mechanics", Standard book house, New Delhi, ISBN: 978-81-89401-26-9
2. Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
3. T Bernard Massey and John Ward Smith, "Mechanics of Fluids", Taylor and Francis, 8 Edition (2006) London and New York.
4. Douglas J. F. Gaisorek J. M., Swaffield J. A., "Fluid Mechanics" Addison-Weisley Harlow 1999
5. Shames I. H., " Mehcanics of Fluids", McGraw-Hill, New York 1992.

Reference Books

1. Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
2. Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd New Delhi
3. J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
4. Y.A. Cingel L.M. Oimbala, Fluid Mechanics (S1 Units)", Tata McGraw Hill.
5. R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.

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Concrete Technology Laboratory

23CE2407	**PCC**	**Concrete Technology Laboratory**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	CA-I : 15 Marks CA-II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine the quality of ingredients of concrete as per IS codes.
CO2	Design a concrete mix as per the requirement at the field using various codes.
CO3	Asses the suitability of NDT methods on field.
CO4	Apply compressive strength of concrete cubes

All experiments are compulsory

Part I

Test in Lab

1. To determine fineness of cement by Sieve analysis
2. To determine the standard consistency of cement using Vicat's apparatus.
3. To determine initial and final setting time of cement.
4. Determination of soundness of cement by Le- Chatelier's apparatus and/or Auto Clave test.
5. To determine compressive strength of cement.
6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate).
7. Determination of specific gravity of fine aggregates.
8. Determination of specific gravity and water absorption of coarse aggregates.
9. To determine flakiness and elongation index of coarse aggregates.
10. To determine workability of fresh concrete by using slump cone and/or Vee Bee consistometer.
11. To determine compaction factor for workability of fresh concrete.
12. Nondestructive test on concrete by: Rebound Hammer Test, Ultrasonic Pulse Velocity Test.
13. Tests for compressive strength of concrete cubes for M20 or M30 (ACI 211.1-91, IS 10262-2009 and IS 456 2000).

Part II

Site Visit

1. NDT Project (using rebound hammer and ultrasonic pulse velocity tests) on any site with a short report.
2. Site visit to study advances in Concrete Technology (like RMC, Pumped concrete etc.) with a short report.

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Text Books

1. Gambhir M. L. " Concrete Technology" , Tata Mc-Graw Hill 2015 15th edition
2. Shetty M. S. "Concrete Technology", S. Chand 2005.
3. Krishnaswamy, " Concrete Technology" , DhanapatRai and Sons

Reference Books

1. Orchard, " Concrete Technology" , Applied Science Publishers
2. Neville A. M., "Concrete Technology" , Pearson Education
3. Neville A. M., " Properties of Concrete" , Pearson Education
4. IS:10262(2009), IS:456 (2009) by Bureau of Indian Standards, New Delhi

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Planning Essentials

23CE2408	**VSEC**	**Planning Essentials**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hr/week	CA-I : 15 Marks CA-II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to

CO1	Determination of horizontal distance and elevation of point using Tacheometer and its application in Civil Engineering
CO2	Determine and apply the data necessary for curve setting
CO3	Demonstrate use of leveling instrument for RL determination ,and its use to prepare the contour map
CO4	Draw plan and sectional view of road from field measurement ,and estimate the quantity of earthwork from field measurement /software

All experiments and projects are compulsory

Part-I

List of Experiments

1. Experiment on determination of tacheometric constants
2. Experiment on finding the gradient of line
3. Experimental planning to find the area of polygon
4. Experiment on total station traversing
5. Experiment on Curve setting by linear method
6. Experiment on Curve setting by angular method
7. Experiment on Setting of transition curve
8. Experiment on length calculation from GPS co-ordinates
9. Preparation of report on Topographic map
10. Demonstration of software in surveying

Part-II

Projects

1. Road Project: 300 m -600 m
2. Radial Contouring

Text Books:

1. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune Vidyarthi Griha Prakashan, Pune.
2. Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

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Reference Books

1. Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
2. Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
3. Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
4. Subramanium R., "Surveying & Levelling", Oxford University Press. 52
5. Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
6. Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
7. Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi.
8. IRC:38:1988, Guidelines for design of horizontal curves for highways and design table
9. IS:11134-1984, Code of practice for setting out of buildings

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Building Planning Laboratory

23CE2409	**EMC**	**Building Planning Laboratory**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical :2 hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Course Outcomes: At the end of the course, students will be able to

CO1	Identify the required space for planning.
CO2	Gain a broad understanding of planning of public buildings as per the requirements.
CO3	Prepare the drawing for building in a professional set up.
CO4	Draw perspective drawing for a building object.

All experiments are compulsory

List of Experiments:

A. Draw to a suitable scale on Full Imperial Drawing Sheet

A1.Human Body figures and its application in space design

A2. Draw line plan for Any FIVE type of Public Buildings.

- Primary Health Center.
- School Building.
- Head Post Office.
- Bank.
- Super specialty Hospital.
- Commercial mall.
- Railway station.
- Bus Station

B. Drawing to a scale on Full Imperial Drawing Sheet

B1. Planning & design of a building (Minimum G+1) drawings for Municipal submission drawing which contents:-

- All Floor Plans
- Minimum one Section passing through WC/Staircase
- Minimum one elevation
- Site plan (Water Supply and Sewer line)
- Key Plan
- North Direction
- Construction Notes
- Schedule of Openings
- Area Statement
- Project Title.

B2. Prepare detailed working drawing of Experiment no B1 Each sheet should be separate of the

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following.

- Foundation / Center Line drawing.
- Staircase design and detail drawing.
- Electrical layout drawing.
- Furniture layout drawing.
- Plumbing and Water Supply Drawing.

B3. Two Point Perspective drawings for any object like steps…..

Note: Students should be visited minimum five sites to existing or ongoing public building.

Text Books:

1. Shah, Kale, Patki, Building Drawing –Tata McGraw- Hill
2. Y. S. Sane, Building Design and Drawing – Allied Book Stall, Pune
3. Jain A.K., The Idea of Green Building Khanna Publishers, N. Dehli,
4. V.B. Sikka, A Course in Civil Engineering Drawing – S.K. Kataria and Sons
5. N. Kumara Swamy and A. Kameswara Rao,"Building Planning and Drawing", 8th Edition, Charotar Publications, 2010.

Reference Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2. SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
3. I.S. 962 – 1989 Code for Practice for Architectural and Building

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Mini Project

23CE2410	CEP	Mini Project- III	0-0-2	1 Credits

Teaching Scheme:	Examination Scheme:
Practical: 2hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Pre-Requisites: Mini Project-I, Mini Project II

About Ideathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Content

Week 1:Survey Design-1 • Ensure case study group students have made necessary communication and done a preparatory visit. • Watch the lecture on survey design and study the notes. • Prepare a questionnaire and try it out with your group members as mock.	[2]
Week 2: Survey Design-2 • Review survey questionnaire prepared by case study groups. • Decide sampling strategy. • Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork • Data Collection:Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). • Use data collection tools like questionnaires, observation checklists, and digital analytics. • Ensure data accuracy and reliability through proper sampling and recording methods.	[2]
Week 4: Trails and Experimentation-1	

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• Initial Setup and Configuration • Concept Validation • Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 • Prototyping • Functionality Testing	[2]
Week 6: Trails and Experimentation-3 • Bug Identification and Fixing • Integration Testing • Security Testing • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results • Coordinator has to check and verify below points in term of result: • Functional Performance • Accuracy and Precision • Efficiency • Safety	[2]
Week 8: Validation • Coordinator has to check and verify below points in term of validation: • Testing and Verification • Compliancewith Standards	[2]
Week 9: Integration Testing • Validate that the hardware integrates seamlessly with other systems or components as intended • Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10:Documentation and Reporting • Maintain comprehensive documentation of design, development, testing, and validation processes • Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation • 100% Presentation has to be conducted by mentor/guide based on above activity. • Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition • Mini project exhibition will be schedule with interdepartmental evaluation.	[2]

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Construction Management

23CEMDA2	MDM	Construction Management	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3hrs/week	CA-I :10 Marks CA-II :10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the concepts of construction management and construction theories
CO2	Apply the management principles and planning
CO3	Analyze the process of project management and organization of management
CO4	Develop the schedule of activities in a construction project.
CO5	Apply management principles in construction management
CO6	Develop the concepts of construction site management

Course Contents

Unit 1: Introduction Introduction to Construction management, Major problems in Construction Industry, History of Construction Management, Evolution of management thoughts& theories of F.W. Taylor, Henri Fayol, Max Weber, etc., SWOT Analysis in construction	[5]
Unit 2: Management Planning Management planning and principles, importance of planning, Nature and purpose of planning, planning process, types of planning, objectives, setting objectives, planning premises, strategic management	[5]
Unit 3: Project Management Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Organization of management, Organizational Hierarchy, types of organizations	[8]
Unit 4: Project Management through network Critical path method, early and late time calculations, Float, critical path, resource allocation, network compression. Programme evaluation & review technique (PERT), expected times and slack, probability of completion time of a project, construction safety standards.	[6]
Unit 5: Construction management Management Information and Control Systems, Communication, System Concepts, Need for Management Information, Design of Management Information Systems, Value of Information,	[6]

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Management Information Systems in Construction Industry.	
Unit 6: Construction site Management: Site mobilization-demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers ,Engineers , Supervisors.	[5]

Text Books

1. S. Seetharaman. Construction Engineering and Management. Umesh Publication. 2. R L Peurifoy, C J Schexnayder, A. Shapira. Construction planning, equipment and methods. Mc Graw Hill Education (India).
2. Knutson, K, Schexnayder, C J, Fiori, C. and Mayo, R E (2013) Construction Management, Fundamentals, MCGraw Hill Publishers.

Reference Books

1. CPWD Works Manual, 2019, Nirman Bhawan, New Delhi.
2. Standard operating procedure for CPWD Works Manual, 2019, Nirman Bhawan, New Delhi.
3. Fewings, P (2011) Construction Project Management - An integrated approach, Taylor and Francis.
4. Goetsch, D L (2015) Project Management for construction, Pearson publishers.
5. Ottoson, H (2013) Practical project management for building and construction, CRCPress, Taylor and Francis.

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Infrastructural Planning and Design

23CEMDB2	MDM	Infrastructural Planning and Design	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3hrs/week	CA-I :10 Marks CA-II :10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Building Material, Construction & Maintenance

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain concepts related to infrastructure
CO2	Apply infrastructure economics and finance
CO3	Interpret challenges to successful infrastructure planning
CO4	Make use of policies and regulatory frameworks
CO5	Utilize phases and players in infrastructure planning and managements
CO6	Develop the design for infrastructure service life

Course Contents

Unit 1: Basic Concepts Related To Infrastructure Introduction to Infrastructure, an overview of the Power Sector in India, Water Supply and Sanitation Sector in India, Road, Rail, Air and Port Transportation Sectors in India, Telecommunications Sector in India, Urban Infrastructure in India, Rural Infrastructure in India, an Introduction to Special Economic Zones.	[6]
Unit 2: Infrastructure Economics And Finance Principles of Finance, Infrastructure Economics, Developing Financial Models for Infrastructure, Introduction to Project Finance.	[6]
Unit 3: Challenges To Successful Infrastructure Planning Risks and Challenges in Infrastructure, Introduction to Social Environmental Risk in Infrastructure, Economic Risk in Infrastructure, Political Risk in Infrastructure.	[6]
Unit 4: Policy And Regulatory Frameworks Government policies and initiatives for infrastructure development, Regulatory bodies and their roles in infrastructure planning and design, Public-private partnerships (PPP) in infrastructure projects.	[6]
Unit 5: Phases And Players In Infrastructure Planning And Managements Introduction to the Infrastructure Process, Description of Stages, Project Lifecycle, Construction, Operation and Maintenance of Infrastructure, Infrastructure Players.	[6]
Unit 6: Design For Infrastructure Service Life Introduction to Design concepts, Design technology framework, design requirements, design phase, design constraints, Case study.	[6]

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Text Books

1. Verma S.P. ed. "Infrastructure in India's Development: Power, Transport and Communication", Institute of Public Administration, New Delhi, 2004.

Reference Books

1. Goodman, Alvin S. and Makarand Hastak. Infrastructure Planning Handbook: 2006.
2. Revelle, C.S., Whitlatch, E.E. and Wright, J.R. Civil and Environmental Systems Engineering; Prentice Hall, 2004.
3. Hudson W. and Ralph H. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation, Tata Mc Graw Hills.
4. The India Infrastructure Report, Ministry of Finance, Govt. of India.

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Railway Engineering

23CEMDC2	MDM	Railway Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3hrs/week	CA-I :10 Marks CA-II :10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Surveying I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the knowledge on elements of permanent way in Railways, selection of gauges, route alignment surveys.
CO2	Apply the knowledge of hauling capacity, stresses in rails, ballast, sleepers, joints in rails.
CO3	Explain Flash-Butt weld, Short Welded Rail, Creep in Rails, Buckling of Rails,Cant excess, cant deficiency, Transition curves, Widening at curve.
CO4	Identify turnouts its types and Design, Crossings, Track Junctions and Design; Signals, Types of signals, Signal placements, Interlocking of tracks.
CO5	Explain track maintenance, drainage of track, high-speed rails.
CO6	Explain Location and layout of stations and yards, role of Indian Railways in Nation development, EIA.

Course Contents

Unit 1: Introduction History of Railway, Indian Railways, Development of Indian Railways, Railway Survey, Reconnaissance Survey, Preliminary Survey, Location Survey, Construction of new Railway Line	[6]
Unit 2: Train Resistance And Rail Gauges Train Resistances, Rolling Stock, Locomotives, Coaches, Wagons, Train Brakes, Gauges, Gauges in different countries, Uniformity in gauges, Permanent Way and its requirement, Functions of rails, Types of rails, Sections of Rails	[6]
Unit 3: Railway Planning And Construction Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage- Level Crossings-Signaling.	[6]
Unit 4: Welding And Curves In Railway Long Welded Rails, Continuous Welded Rails, Fastenings for Rails-to-Rail, Fastenings for Rail-to-Sleeper, Track Alignment – Need, Requirements, Selection factors. Speed on track – Safe, Permissible, Equilibrium, Cant excess, cant deficiency, Transition curves, Widening at curve, clearances, Gradients.EIA in Railways and case studies.	[6]
Unit 5: Interlocking Turnouts – Types and Design, Crossings – Types and Design. Track Junctions and Design; Signals	[8]

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– Classification and functions, Types of signals, Signal placements; Interlocking of tracks – Standards, Principles, Isolation. Interlocking on tracks: Key, Mechanical, Route Reply, Electrical, Electronic interlocking; Train Control Systems: Block and non-block systems; Railway stations – Types, Yards, Level crossings.	
Unit 6: Maintenance Of Tracks General, Necessity for maintenance of track, Maintenance of railway bridges, Signaling during maintenance, Rail Inspection, Track Inspection, Drainage of Tracks – surface and subsurface.	**[4]**

Text Books

1. Railway Engineering, Rangwala, Charotar Publishing House Pvt Limited.
2. Rail Engineering by S. Chandra , Arora & Saxena

Reference Books

1. Basic of Track Structure and Components, Indian Railways Center for Advanced Maintenance Technologies, IRCAMT, Maharajpur, Gwalior, 2023
2. Basics of Railway Signal Engineering by G V Rao, ITD-2, Indian Railways Institute of Signal Engineering and Telecommunication, IRISET, Secundrabad
3. Handbook on welding techniques, Indian Railways Center for Advanced maintenance Technologies, IRCAMT, Maharajpur, Gwalior
4. India's Bullet Train Ride- The Journey so far, National High Speed Rail Corporation Limited, 2023
5. Indian Railway Maintenance Manual (Works)
6. Indian Railway Standard Specification for 10 mm thick Composite Grooved Rubber Sole Plates for placing beneath rails, M&C Directorate, RDSO, Lucknow, 2020

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Air and Noise Pollution Control

23OECE22	OE	Air and Noise Pollution Control	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3hrs/week	CA-I :10 Marks CA-II :10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the atmosphere & amp; meteorology and its importance in Air Pollution
CO2	Estimate air pollutant concentration and understand different norms of air quality
CO3	Explain effect of air pollutants on environment
CO4	Explain different air pollution control measures
CO5	Explain effects of noise on human, animals and plants
CO6	Summarize the various techniques of noise measurement and control for community and industries sources

Course Contents

Unit 1: Introduction to Air Pollution Atmosphere-Structure and Composition, Definition of air pollution, Stationary and mobile sources of air pollutants, Types of air pollutants- according to origin, chemical composition and state of matter.	[5]
Unit 2: Effect of air pollutant Effects of Air Pollution on human, vegetation, Animals; Acid rain, Global Warming, Climate Change and Greenhouse Effect, Ozone Layer Depletion, air pollution episodes. Air pollution Case study- London smog, Bhopal gas tragedy	[7]
Unit 3: Air Sampling and Analysis Units of measurement of air pollution, Study of Settling Chamber, High Volume Air Sampler (HVAS), Air quality index with numerical, ambient air quality monitoring as per CPCB.	[6]
Unit 4: Air pollution control measures Plume and its behavior, stack height, Introduction to air pollution control instruments- Scrubbers, Electrostatic precipitators (ESPs), air filters and cyclones, air pollution control strategy in India.	[6]
Unit 5: Introduction to Noise pollution Engineering definition of noise and sound, Properties of sound- sound power, sound intensity, sound pressure level, sources and types of noise, effects of noise on human health and wild life.	[6]
Unit 6: Industrial noise –sources and health monitoring Noise monitoring in industries, Noise indices, Industrial materials and methods to control noise pollution, control of noise- at source, along path and at receiving end, Noise Pollution(Regulation and Control)rules2020.	[6]

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Text Books

1. "Air Pollution" by Wark K. and Warner C. F. (H. R. Publication).
2. "Air Pollution Vol. I and II" by Stern A. C. (Allied Publishers Limited).
3. "Air Pollution" Rao H.V.N. and Rao M. N., Tata (McGraw Hill).
4. IS code for practice for noise reduction in industrial buildings IS: 3483, 1965.

Reference Books

1. "Air Pollution Control Engineering" by Noel de Nevers (Waveland Press, Inc.).
2. "An Introduction to Air pollution" by R.K. Trivedi and P. K. Goel (B. S. Publications).
3. "Noise Pollution" by S.K. Agarwal, (APH Publishing Corporation, New Delhi. New Delhi).

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Aptitude Skill-II (Numerical Ability)

23HSSM01	VEC	Aptitude Skills- II	1-0-0	1 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Pre-Requisites: Basic Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
CO2	Solve questions based on Number system
CO3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
CO4	Solve questions based on Profit & Loss and mensurations.

Course Content

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	[3]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[3]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership **Speed- Time- Distance** Speed, Time, and Distance, Trains, Boats, Streams, Races	[3]
Unit 4: Business Aptitude Profit & Loss, Simple Interest, Compound Interest **Geometry and Venn Diagram** 2D and 3D Mensuration, Venn diagram	[3]

Text books:

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition

Reference books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar

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Language Skill- II

23HSSM02	**VEC**	**Language Skill- II**	**0-0-2**	**1 Credits**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	CA-I : 25 Marks CA-II : 25 Marks

Pre-Requisites: Language Skill- I

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using Functions.
CO2	Make use of Structures & Union to develop programs in C language
CO3	Make use of Pointers to develop programs in C language
CO4	Develop programs to perform various operations on files using File Handling.

Course Content

1. Develop programs on using different built-in functions.
2. Develop programs on using function without argument and without return category.
3. Develop programs on using function with argument and without return category.
4. Develop programs on using function without argument and with return category.
5. Develop programs on using function with argument and with return category.
6. Develop programs using more than one used defined functions.
7. Develop programs on recursion.
8. Develop programs on Structure using various entities and size of structure.
9. Develop programs on array of structure.
10. Develop programs on structures and functions and compare structure and union.
11. Develop programs to display different data type of data and their addresses using pointer
12. Develop programs on pointer to array, pointer to structure, pointer to functions and pointer expressions.
13. Develop program to read, write and append data from a file.

Text books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar

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