Department: Department of Civil Engineering **Rev:** Course Structure /01/NEP/2023-24

Class: S.Y. B. Tech. **Semester:** III

Course Code	Type of Course	Course	Teaching Scheme				Evaluation 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 Languages	02	-	-	2	25	25	-	-	50	02
TOTAL			**17**	**-**	**10**	**27**	**230**	**230**	**150**	**290**	**900**	**22**

Multidisciplinary Minor - I

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

Open Elective-I

Engineering Management

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

Engineering Mathematics-III

23CE2301	**PCC**	**Engineering Mathematics-III**	**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: 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]**
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.

Strength of Materials

23CE2302	PCC	Strength of Materials	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: 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]**

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.

Surveying-I

23CE2303	PCC	Surveying-I	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: 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]**

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

Entrepreneurship Development

23CE2304	**HSSM**	**Entrepreneurship Development**	**1-0-0**	**1 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture: 1 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 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)

Strength of Materials Laboratory

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

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

Surveying-I Laboratory

23CE2306	PCC	Surveying-I Laboratory	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 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.

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

Introduction to Drawing Laboratory

23CE2307	**VSEC**	**Introduction to Drawing Laboratory**	**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	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

Mini Project

23CE2308	CEP	Mini Project- II	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

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. • 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.	**[2]**
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]**

Construction Equipment

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

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	CA-I : 10 Marks CA-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]**

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

Building Material and Management

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

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	CA-I : 10 Marks CA-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]**

Text books:

1. A Text-Book of Building Construction, S.P. Bindra and S.P. Arora, Dhanpat Rai Publications
2. "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

Modes of Transportation Engineering

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

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	CA-I : 10 Marks CA-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]**

Unit 6: Maritime and Waterway Transportation	**[4]**
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).	

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

Engineering Management

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

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/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 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]**
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.

Aptitude Skill-I (Verbal Ability)

23HSSM01	**VEC**	**Aptitude Skills- I**	**1-0-0**	**1 Credits**

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

Language Skill- I

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

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

Modern Indian Language

23MILE01	AEC	Marathi	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 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	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]
अध्याय 05: लेखन प्रकार पत्र लेखन व त्याचे प्रकार-निमंत्रण, आभार, अभिनंदन, मागणी, कोटुंबिक, विनंती, तक्रार	[5]

संधी -स्वरसंधी, व्यंजनसंधी, विसर्गसंधी, वृत्तलेखन, जाहिरातलेखन, कथालेखन, अहवाललेखन, आवेदनपत्र, अभिप्रायलेखन	
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:

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

Modern Indian Language

23MILE02	AEC	Hindi	2-0-0	2 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 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	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