



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

**Department:** Civil Engineering  
**Class:** Final Year B. Tech

**Rev:** Course Structure /01/NEP/2024-25  
**Semester:** VII

| Course Code  | Course Type | Course                                       | Teaching Scheme |          |           |            | Evaluation Scheme |            |            |            |            | Credits   |
|--------------|-------------|----------------------------------------------|-----------------|----------|-----------|------------|-------------------|------------|------------|------------|------------|-----------|
|              |             |                                              | L               | T        | P         | Total Hrs. | CAI               | CAII       | MSE        | ESE        | Total      |           |
| 23CE4701     | PCC         | Estimation and Costing                       | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CE4702     | PCC         | Design of Concrete Structure -II             | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CE4703X    | PEC         | Program Elective Courses-IV                  | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CE4704X    | PEC         | Program Elective Courses-V                   | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CEMDXX     | MDM         | Multidisciplinary Minor-V                    | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CE4705     | PCC         | Estimation and Costing Laboratory            | -               | -        | 02        | 02         | 15                | 15         | -          | 20         | 50         | 01        |
| 23CE4706     | VSEC        | Structural Design And Drawing –II Laboratory | -               | -        | 02        | 02         | 15                | 15         | -          | 20         | 50         | 01        |
| 23CE4707     | ELC         | Research Methodology                         | 03              | -        | -         | 03         | 10                | 10         | 30         | 50         | 100        | 03        |
| 23CE4708     | VEC         | Values and Ethics                            | 02              | -        | -         | 02         | 25                | 25         | -          | -          | 50         | Audit     |
| 23CE4709     | RM          | Industrial Case Study (Research Seminar)     | -               | -        | 02        | 02         | 25                | 25         | -          | -          | 50         | 01        |
| 23CE4710     | ELC         | Mega Project Phase -II                       | -               | -        | 04        | 04         | 25                | 25         | -          | 50         | 100        | 02        |
| <b>TOTAL</b> |             |                                              | <b>20</b>       | <b>-</b> | <b>10</b> | <b>30</b>  | <b>165</b>        | <b>165</b> | <b>180</b> | <b>390</b> | <b>900</b> | <b>23</b> |

**Program Elective Courses – IV**

|                                             |                              |                                                  |
|---------------------------------------------|------------------------------|--------------------------------------------------|
| Advance Prestressed Concrete<br>(23CE4703A) | Town Planning<br>(23CE4703B) | Legal Aspect in Civil Engineering<br>(23CE4703C) |
|---------------------------------------------|------------------------------|--------------------------------------------------|

**Program Elective Courses - V**

|                                                    |                                          |                                    |
|----------------------------------------------------|------------------------------------------|------------------------------------|
| Analysis of Indeterminate Structure<br>(23CE4704A) | Water and Land Management<br>(23CE4704B) | Traffic Engineering<br>(23CE4704C) |
|----------------------------------------------------|------------------------------------------|------------------------------------|

**Multidisciplinary Minor –V**

|                                                  |                                                |                                                  |
|--------------------------------------------------|------------------------------------------------|--------------------------------------------------|
| <b>Infrastructure Engineering<br/>(Basket A)</b> | <b>Architectural Aspect<br/>(Basket B)</b>     | <b>Transportation Engineering<br/>(Basket C)</b> |
| Contract Accounts and Tenders<br>(23CEMDA5)      | Professional Practice and Ethics<br>(23CEMDB5) | Bridge Engineering<br>(23CEMDC5)                 |



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**Estimation and Costing**

|                 |            |                               |              |                  |
|-----------------|------------|-------------------------------|--------------|------------------|
| <b>23CE4701</b> | <b>PCC</b> | <b>Estimation and Costing</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|-----------------|------------|-------------------------------|--------------|------------------|

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| 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:** Construction material, Building Drawing, Engineering Management

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

|            |                                                                                            |
|------------|--------------------------------------------------------------------------------------------|
| <b>CO1</b> | Interpret the purpose, types, and units of measurements for estimating civil works.        |
| <b>CO2</b> | Develop approximate and detailed estimates using standard methods.                         |
| <b>CO3</b> | Analyze rates for various construction items using standard schedule of rates (SSR).       |
| <b>CO4</b> | Explain specifications, their importance, and drafting of general/detailed specifications. |
| <b>CO5</b> | Construct tender documents; understand contract types, and knowledge of B.O.T projects.    |
| <b>CO6</b> | Identify valuation principles, methods, depreciation, and rent fixation of buildings.      |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                    |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: : Introduction to Estimation and Quantity</b><br>Importance and objectives of estimating, Types of estimates: preliminary, detailed, revised, supplementary, etc. Units of measurement as per IS 1200, Items of work in different types of civil engineering projects, Taking out quantities – center line and long wall-short wall methods.            | <b>[06]</b> |
| <b>Unit 2: Detailed and Approximate Estimates</b><br>Methods of approximate estimation (plinth area, cubic rate, bay method etc.) ,Detailed estimate for buildings: earthwork, concrete, brickwork, plastering, etc. ,Preparation of Abstract of Cost ,Technical sanction and administrative approval ,Contingencies, work-charged establishment, tools and plants | <b>[06]</b> |
| <b>Unit 3: Analysis of Rates</b><br>Purpose and factors affecting rate analysis, Task or out-turn of labour, lead, lift, and transportation, Analysis of rates for: Earthwork, PCC, RCC, Brickwork, Plastering, Flooring, etc. Introduction to Standard Schedule of Rates (SSR) and DSR                                                                            | <b>[06]</b> |
| <b>Unit 4: Specifications</b><br>Definition, purpose, and importance of specifications, General specifications for civil works, Detailed specifications for common building items (brickwork, concrete, plaster, etc.).                                                                                                                                            | <b>[06]</b> |
| <b>Unit 5: Tenders, Contracts, and B.O.T Projects</b><br>Definition and types of contracts: item rate, lump sum, cost-plus, labour contracts, etc. Tender process: Notice Inviting Tender (NIT), Earnest Money Deposit (EMD), tender form, Comparative statement, acceptance, and agreement ,Contractor classifications, prequalification                          | <b>[06]</b> |



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|                                                                                                                                                                                                                                                                                                                                                                                           |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| of contractors ,Introduction to B.O.T (Build-Operate-Transfer) and PPP models.                                                                                                                                                                                                                                                                                                            |             |
| <b>Unit 6: Valuation and Depreciation</b><br>Introduction to valuation and valuer's duties ,Purpose and principles of valuation Different methods of valuation: Rental, Profit, Direct Comparison, etc. ,Depreciation and methods: Straight line, Sinking Fund, etc., Fixation of rent, capitalized value, scrap value, salvage value .Numerical problems on valuation and depreciation . | <b>[07]</b> |

**Text Books:**

1. B.N. Dutta – Estimating and Costing in Civil Engineering, UBSPublishers
2. M. Chakraborti – Estimating, Costing, Specification and Valuation in Civil Engineering, Laxmi Publications
3. G.S. Birdie– A Textbook of Estimating and Costing, DhanpatRai Publishing
4. S.C. Rangwala – Estimating, Costing and Valuation, Charotar Publishing House

**Reference Books:**

1. National Building Code of India (NBC) – Bureau of Indian Standards
2. Standard Schedule of Rates (SSR) – CPWD/PWD Publications
3. IS:1200 series – Indian Standard Methods of Measurement of Building Works
4. P.W.D. Handbook – Respective State PWD Guidelines



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**Design of Concrete Structure -II**

|                 |            |                                         |              |                  |
|-----------------|------------|-----------------------------------------|--------------|------------------|
| <b>23CE4702</b> | <b>PCC</b> | <b>Design of Concrete Structure -II</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|-----------------|------------|-----------------------------------------|--------------|------------------|

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| 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:** Design of Concrete Structure -II

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

|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| <b>CO1</b> | Design of water tank by using working stress method.                     |
| <b>CO2</b> | Design of continuous beam (Two spans and three spans).                   |
| <b>CO3</b> | Design the combined footing& raft foundation.                            |
| <b>CO4</b> | Explain the concept of pre stressing.                                    |
| <b>CO5</b> | Analyze the losses of pre stress in pre and post tensioned system.       |
| <b>CO6</b> | Design of pre stress concrete section-Limit state of collapse in flexure |

**Course Content:**

|                                                                                                                                                                                                                                                                                        |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Design of water tank</b><br>Design of water tank - Introduction to working stress method for water tank design, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks (ii) rectangular water tanks. | <b>[07]</b> |
| <b>Unit 2 : Design of continuous beams</b><br>Limit state Design of two span continuous beams and three span continuous beams using IS coefficient, concept of moment redistribution                                                                                                   | <b>[07]</b> |
| <b>Unit 3 : Design of combined footing</b><br>Foundation - Design of combined footing (Slab type, slab beam type) and design concept of raft foundation.                                                                                                                               | <b>[06]</b> |
| <b>Unit 4 : Introduction to prestress</b><br>Basic concept of pre stressing. Historical development. Types and systems of pre stressing. Analysis of rectangular and symmetrical I sections. Different cable profiles.                                                                 | <b>[07]</b> |
| <b>Unit 5 : Losses of pre stress</b><br>Losses of pre stress in Pre & Post tensioned members. Flexural strength of pre stress concrete section                                                                                                                                         | <b>[06]</b> |
| <b>Unit 6 : Design of pre stress concrete</b><br>Design of pre stress concrete - rectangular and Symmetrical I sections for following criteria: (i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.                                   | <b>[07]</b> |



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**Text books:**

1. Limit state theory and Design –Karve and Shah , Structures publications , Pune.
2. Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi.
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee.

**Reference books:**

1. IS 456-2000, Plain And Reinforced Concrete - Code Of Practice
2. IS 1343 (1980): Code of Practice for Prestressed Concrete
3. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi.
4. Reinforced Concrete Design-M. L. Gambhir - Mcmillan India Ltd. New Delhi.



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**Program Elective Courses- IV**

|                  |            |                                                  |              |                  |
|------------------|------------|--------------------------------------------------|--------------|------------------|
| <b>23CE4703A</b> | <b>PEC</b> | <b>A) Advance Pre-stress Concrete structures</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|------------------|------------|--------------------------------------------------|--------------|------------------|

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| 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:** Strength of materials, Structural analysis-I

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

|            |                                                              |
|------------|--------------------------------------------------------------|
| <b>CO1</b> | Explain basic principles of pre-stressing.                   |
| <b>CO2</b> | Design rectangular and I sections pre-stressed beam.         |
| <b>CO3</b> | Analyze and design end block in post tensional members.      |
| <b>CO4</b> | Analyze and design pre-stress concrete pipes and sleepers.   |
| <b>CO5</b> | Analyze and design single bay portal frame for single story. |
| <b>CO6</b> | Design pre-stress concrete one way and two way slab.         |

**Course Content:**

|                                                                                                                                                                                                                                                                               |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Introduction to Pre-Stress Concrete</b><br>Introduction to pre-stressed concrete ,Materials, Basic principles of Pre-stressing, Load balancing concept, stress concept, center of thrust, Various losses encountered in pre-tensioning and post-tensioning methods | <b>[06]</b> |
| <b>Unit 2: Design of Beams</b><br>Design of beams : Rectangular and I sections for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes                                                                                                          | <b>[06]</b> |
| <b>Unit 3: Design of End blocks</b><br>Analysis and design of end blocks in post tensional members, primary and secondary distribution zones, Bursting and spalling tensions                                                                                                  | <b>[06]</b> |
| <b>Unit 4: Design of Pipes and Sleepers</b><br>Analysis and design of pre-stressed concrete structures such as concrete pipes and Sleepers.                                                                                                                                   | <b>[06]</b> |
| <b>Unit 5 Design of Portal Frames</b><br>Analysis and design of portal frames, single storey and limited to one bay.(Fixed and Hinged).                                                                                                                                       | <b>[06]</b> |
| <b>Unit 6 Design of Pre-Stress Slab</b><br>Design of pre-stressed concrete Floor slab, one way and two way slab.                                                                                                                                                              | <b>[06]</b> |



  
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**Text Books:**

1. N. Krishna Raju, Prestressed Concrete Design, McGraw Hill Publications, 6th edition, 2018.
2. P. Dayaratnam, Prestressed Concrete Design, Medtech publishers, 7th edition, 2017.
3. N. Rajgopalan, Prestressed Concrete Design, Narosa Publishers 2nd edition, 2010.
4. E.G. Nawy, Prestressed Concrete Design, Pearson publication, 2nd edition, 1995.
5. T.Y. Lin — Prestressed Concrete, John Wiley & sons Inc. New York, 3rd Edition, 1981.

**Reference Books:**

1. "Design of Prestressed Concrete Structures" by T Y Lin and N H Burns
2. "Prestressed Concrete Analysis and Design: Fundamentals" by A E Naaman
3. "Prestressed Concrete Bridges" by N Krishnaraju
4. "Limit State Design of Prestressed Concrete" by Y Guyan
5. "Prestressed Concrete Design" by Nagarajan



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**Program Elective Courses-IV**

|           |     |                  |       |           |
|-----------|-----|------------------|-------|-----------|
| 23CE4703B | PEC | B) Town Planning | 3-0-0 | 3 Credits |
|-----------|-----|------------------|-------|-----------|

|                         |                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                                                   |
| Lecture: 3 hrs/week     | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

**Pre-Requisites:** Transportation Engineering

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

|     |                                                                                                                            |
|-----|----------------------------------------------------------------------------------------------------------------------------|
| CO1 | Apply principles and stages of town planning to understand development patterns and land use distribution in modern towns. |
| CO2 | Explain the building classifications and housing policies.                                                                 |
| CO3 | Evaluate urban renewal strategies and redevelopment concepts for improving existing towns.                                 |
| CO4 | Interpret building bye-laws and master plan components for planned urban development.                                      |
| CO5 | Classify and design urban road systems for efficient transportation planning.                                              |
| CO6 | Analyze traffic management principles to mitigate congestion and improve road safety in urban areas.                       |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                    |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 1: Introduction</b><br>Necessity, Principles of town planning, Stages of town development, Distribution of land uses, Forms of planning, Planning of Modern and military town , Cost of town planning, Recent planned cities in India                                                                                                                      | [06] |
| <b>Unit 2: Town Planning surveys and other features</b><br>Types of surveys, Principles and advantages of zoning, Transition, Classification & design of Residential buildings, Rural and low cost housing, National housing policy, Prevention of slum formation, Requirements of industries, Industrial township, Classification & design of public buildings.   | [06] |
| <b>Unit 3: Re-Planning of Existing Towns</b><br>Objectives, Urban Renewal projects, Decentralization and Recentralization, Three magnet theory, Garden city concept, Satellite towns, Defects in existing towns, Requirement & shapes of surface drain, Refuse of town. Case studies: Kashi and Ajodhya Redevelopment                                              | [06] |
| <b>Unit 4: Building by-laws and development/master plans</b><br>Bye-laws for buildings, Bye-laws for cinemas/theaters etc. Fire protection, Planning standards, Features for master plans, necessity, Master plans for military town and hill stations, Stages and methods for preparation and execution of master plans. Case studies: Chandigarh and Gandhi agar | [06] |



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|                                                                                                                                                                                                                                                                                                                    |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 5: Urban roads</b><br>Classification of Urban roads, Types of street system, Through and by pass roads, outer and inner ring roads, Freeways, Road aesthetics, Cul-de-sac streets, Rapid transit system                                                                                                    | [06] |
| <b>Unit 6: Traffic management</b><br>Traffic congestion, Road Junction and Intersection: angle of crossing, Channelizing, Gradient, Rotaries, Grade separators, Accidents and signals, Roads signs and Markings, Street lighting in a town, Traffic problem in existing towns, Peculiarities of traffic in a town. | [06] |

**Text Books:**

1. Town Planning- Charotar Publication – S.C. Rangwala
2. Building & town planning- Dr. R.P. Rathaliya

**Reference Books:**

1. Fundamentals of town planning- Dhanpat Rai & Sons. – G.K. Hiraskar
2. Planning and Designing of Buildings- Engg. Book Publishers- Sane Y.S.
3. Town Planning and Road Traffic by Sir Alker Tripp. Edward Arnold & Co., London
4. Housing Problems in India by Dr. K.V. Varghese. Eureka Publication, New Delhi



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**Program Elective Courses-IV**

|                  |            |                                              |              |                  |
|------------------|------------|----------------------------------------------|--------------|------------------|
| <b>23CE4703C</b> | <b>PEC</b> | <b>C) Legal Aspects In Civil Engineering</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|------------------|------------|----------------------------------------------|--------------|------------------|

| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture: 3 hrs/week     | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

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

|            |                                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | Illustrate the standard building contracts and provisions of the Indian Contract Act.                       |
| <b>CO2</b> | Interpret legal principles of bailment, indemnity, guarantee, and injunction.                               |
| <b>CO3</b> | Explain the key provisions and applications of Indian labour and industrial acts.                           |
| <b>CO4</b> | Apply knowledge of environmental protection laws and sustainable development in civil engineering projects. |
| <b>CO5</b> | Demonstrate understanding of safety engineering principles and accident prevention methods.                 |
| <b>CO6</b> | Explain employer liabilities and regulatory requirements related to workplace safety.                       |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                        |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Professional Practice and Administration Contracts</b><br>Professional Practice and Administration Contracts: The standard form of building contracts, Indian contract Act, The right of building owner, Right of Contractor, Types of Civil Engineering contracts                                                                                          | <b>[06]</b> |
| <b>Unit 2: Bailment</b><br>Bailment: Nature of Transactions, Delivery of Bailee, care to be taken, Bailee's Responsibility, Termination, Bailment of pledges. Injunction: Types Temporary, Perpetual, Mandatory when referred, Indemnity and Guarantee: Difference between the two, The Contract of Guarantee and Indemnity,                                           | <b>[06]</b> |
| <b>Unit 3: Industrial Acts and Labour Laws</b><br>Industrial Acts and Labour Laws: Indian factories Act, Industrial Dispute Act, Payment of Wages Act, Work Compensation Act, Trade Union Act, The Building and Other Constructions Workers' (Regulation of Employment and Conditions of Service) Act, 1996                                                            | <b>[06]</b> |
| <b>Unit 4: Environmental and Land Laws</b><br>Environmental protection in construction, Provisions of the Environment Protection Act, Environmental Impact Assessment (EIA), Land acquisition process, Overview of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, Town planning and development regulations | <b>[06]</b> |
| <b>Unit 5: Safety Engineering</b><br>Safety Engineering: Sources, Classification, Cost of Accident and Injury Workmen's                                                                                                                                                                                                                                                | <b>[06]</b> |

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|                                                                                                                                                                                                           |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Compensation Act, Safety Programme, Safety Organization.                                                                                                                                                  |      |
| <b>Unit 6: Acts</b><br>Employers Liability Act, Employers Insurance Act, Safety and Health Standards Occupations Hazards, personal Protective equipment, preventive measures Factory Act, Fatal accidents | [06] |

|                                                                                                                                                                                                                                                                         |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Text Books:</b><br>1. Indian arbitration Act by B. S. Patil.<br>2. Indian Contract Act.<br>3. Safety Engineering, Govt. of India Publication.<br>4. Professional Practice, RoshanNamavati.<br>5. Legal Aspects of building and Engineering Contracts by B. S. Patil. |  |
| <b>Reference Books:</b><br>1. Indian Contract Act Avatar Singh.<br>2. Indian contract Act Jhamb.                                                                                                                                                                        |  |



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**Program Elective Courses-V**

|           |     |                                        |       |           |
|-----------|-----|----------------------------------------|-------|-----------|
| 23CE4704A | PEC | A) Analysis of Indeterminate Structure | 3-0-0 | 3 Credits |
|-----------|-----|----------------------------------------|-------|-----------|

| Teaching Scheme:    | Evaluation Scheme:                                                                                                                          |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture: 3 hrs/week | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

**Pre-Requisites:** Strength of materials, Structural analysis-I

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

|     |                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------|
| CO1 | Identify the indeterminacy for structure.                                                            |
| CO2 | Analyze indeterminate beams and frames using the slope deflection method                             |
| CO3 | Analyze indeterminate beams and frames (with and without sway) using the moment distribution method. |
| CO4 | Analyze and construct Influence Line Diagrams (ILDs) for statically indeterminate structures         |
| CO5 | Apply the flexibility method for analyzing beams and frames                                          |
| CO6 | Analyze indeterminate beams and frames by applying the stiffness approach.                           |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                                                |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 1: Introduction to Indeterminacy:</b><br>Concept of Indeterminacy and degree of freedom, Advantages and Disadvantages of Indeterminate Structure, common methods of analysis.                                                                                                                                                                                                          | [06] |
| <b>Unit 2: Slope Deflection Method</b><br>Introduction, sign convention, derivation of slope deflection equations, Analysis of continuous beams including effects of support settlements, Analysis of orthogonal rigid frame including sway frames with kinematic indeterminacy $\leq 3$                                                                                                       | [06] |
| <b>Unit 3: Moment Distribution Method</b><br>Fundamentals and development of the method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames, including sway frames with kinematic indeterminacy $\leq 3$                                                                                                                                            | [06] |
| <b>Unit 4: Indeterminate Influence Lines Structures</b><br>Basic concept and need for IL in indeterminate structures (degree of indeterminacy=1), ILD for Propped Cantilever, (Reaction at propped end, Reaction at fixed end, Shear at a section, Bending moment at a section), Introduction to arch action, ILD for arch (Horizontal reaction, Vertical reactions, Bending moment at crown). | [06] |
| <b>Unit 5: Matrix Method of Analysis – Flexibility Method</b><br>Introduction to axes, coordinates, and flexibility matrix, System approach for analyzing                                                                                                                                                                                                                                      | [06] |

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|                                                                                                                                                                                                                                                                 |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| continuous beams and plane trusses, Analysis of simple orthogonal rigid frames with static indeterminacy $\leq 3$                                                                                                                                               |             |
| <b>Unit 6: Matrix Method of Analysis – Stiffness Method</b><br>Introduction to stiffness matrix formulation, System approach for analyzing continuous beams and plane trusses, Analysis of simple orthogonal rigid frames with kinematic indeterminacy $\leq 3$ | <b>[06]</b> |

**Text Books:**

1. Punmia B.C., "Structural Analysis", Laxmi Publications
2. Khurmi R.S., "Theory of Structures", S Chand, Delhi
3. Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, 3rd edition 2010
4. Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
5. Wang C.K., "Statically Indeterminate Structures", McGraw Hill

**Reference Books**

1. Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi
2. Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
3. Timoshenko and Young, "Theory of structures", McGraw Hill
4. Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH



  
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**Program Elective Courses-V**

|                  |            |                                     |              |                  |
|------------------|------------|-------------------------------------|--------------|------------------|
| <b>23CE4704B</b> | <b>PEC</b> | <b>B) Water and Land Management</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|------------------|------------|-------------------------------------|--------------|------------------|

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| 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:** Basics of Environmental & Water Resources

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

|            |                                                                                          |
|------------|------------------------------------------------------------------------------------------|
| <b>CO1</b> | Summarize the various sources of pollution and its effects.                              |
| <b>CO2</b> | Demonstrate soil erosion, conservation methods and land management.                      |
| <b>CO3</b> | Identify the necessity Losses, Distribution, and reclamation in irrigation.              |
| <b>CO4</b> | Apply the governing equation of ground water flow for different cases.                   |
| <b>CO5</b> | Analyze dewatering systems, filtration, and drainage and seepage for ground Improvement. |
| <b>CO6</b> | Develop advance application technology & water policy.                                   |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                            |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1:Water Pollution</b><br>Definition of Water Pollution, Cause and Sources, Ground water pollution Cause and Sources, R Industrial Waste Effects, Natural methods of wastewater Disposal.                                                                                                                           | <b>[06]</b> |
| <b>Unit 2:Soil and Water Conservation</b><br>Types of wind and water erosion, and factors affecting erosion. Conservation Structures: Design of contour bunds, terraces, gully control structures (check dams, spillways), and farm ponds. Land Management: Land leveling and grading, land use capability classification. | <b>[06]</b> |
| <b>Unit 3:Irrigation Technology and Water Management</b><br>Soil-Moisture Irrigation Relationship, Losses in water canals, Distribution of water into the fields through water courses, Lined canals, Saline and alkaline lands reclamation and management of Salt affected lands                                          | <b>[06]</b> |
| <b>Unit 4:GroundWater Hydrology</b><br>Distribution of Subsurface Water, Different Types of Aquifers, Structure and Types of Wells. Well Hydraulics: Analysis of Steady Radial Flow Towards a Well in a confined Aquifer, Artificial Recharge                                                                              | <b>[06]</b> |
| <b>Unit 5 :Ground Improvement Technique</b><br>Objectives, methods of densification, compactions of coarse and fine grained soils, dewatering systems, stabilization using admixture                                                                                                                                       | <b>[05]</b> |



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**Unit 6: Advanced Technologies and Policy**

RS & GIS: Application of Remote Sensing and Geographical Information Systems for mapping land use, water resources, and degraded lands.

Water Quality & Law: Environmental guidelines, water rights, interstate water sharing issues, and the role of Water User Associations

[07]

**Text Books:**

1. Modi, P.N. —Irrigation, Water Resources and Water Power Engineering| Standard Book House, New Delhi, 2nd ed, 1990.
2. Purushotham Raj, Ground Improvement Techniques, Laxmi publications, New Delhi.
3. A. K. Rastogi., Numerical Groundwater Hydrology, Penram International Publishing (India) Pvt.Ltd.2007.

**Reference Books**

1. Mutreja, K. N. —Applied hydrology|, Tata McGraw Hill Pub. Co., New Delhi, India- 1986.
2. Metcalf and Eddy, A Text Book of Waste Water Engineering



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**Program Elective Courses-V**

|                  |            |                              |              |                  |
|------------------|------------|------------------------------|--------------|------------------|
| <b>23CE4704C</b> | <b>PEC</b> | <b>C)Traffic Engineering</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|------------------|------------|------------------------------|--------------|------------------|

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| 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:** Transportation Engineering

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

|            |                                                                                            |
|------------|--------------------------------------------------------------------------------------------|
| <b>CO1</b> | Identify the characteristics of traffic stream, vehicular and driver behaviors.            |
| <b>CO2</b> | Explain the various methods of traffic surveys and the interpretation of traffic data      |
| <b>CO3</b> | Examine several statistical and photographic methods of Traffic Studies                    |
| <b>CO4</b> | Identify various traffic signs and road marking                                            |
| <b>CO5</b> | Design the traffic signals as per IRC and Webster's method                                 |
| <b>CO6</b> | Identify the parameters of road accident in terms of traffic safety and traffic management |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Introduction</b><br>Introduction, objectives, scope; Driver behaviour and Mixed traffic characteristics of India; PIEV Theory; Macro and microscopic parameters; Relationships among traffic parameters; Traffic flow theory; Characteristics of uninterrupted and interrupted traffic flow facilities; Traffic flow modeling; Capacity and Level-of-service. | <b>[04]</b> |
| <b>Unit 2: Traffic studies</b><br>Traffic volume, speed, travel time and delay studies; Parking study; Origin & Destination Survey, Accident studies, Manual & Mechanical methods, Photographic techniques in Traffic surveys.                                                                                                                                           | <b>[06]</b> |
| <b>Unit 3: Analysis and Interpretation of Traffic Studies</b><br>Statistical method: mean, standard deviation and variance, poisson, binomial distribution, Normal distribution of traffic datas, Histogram and cumulative frequency curves of speed studies, time mean speed and space mean speed.                                                                      | <b>[08]</b> |
| <b>Unit 4: Traffic sign and road markings</b><br>Importance of signs and markings, Types of traffic signs: Prohibitory sign, warning sign, Mandatory sign, overhead sign, Location, height and maintenance of traffic sign, Types of road markings, Parking space limits, object markings                                                                                | <b>[06]</b> |
| <b>Unit 5: Traffic signals</b><br>Types of intersection; Unsignalized, Signalized and rotary intersection; Conflicts at intersection; Signal time and phase diagram; Signal design as per Webster's and IRC method;                                                                                                                                                      | <b>[06]</b> |



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|                                                                                                                                                                                                                                                                                                                |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Introduction to Intelligent Transportation System for traffic management, enforcement and education. Components of ITS.                                                                                                                                                                                        |      |
| <b>Unit 6: Traffic safety and management</b><br>Accident situation in India, Collection of accident data, Collision and condition diagram, pedestrian safety, Traffic management measures and their influence in accident prevention, Scope of traffic management measures, Restrictions of turning movements, | [06] |

**Text Books:**

1. S K Khanna and CEG Justo and A Veeraragavan, Highway Engineering, Nem Chand and Bros.
2. C Jotin Khisty and B Kent Lall, Transportation Engineering: An Introduction, Prentice Hall of India Pvt. Ltd, New Delhi-110001, 2002
3. P. Chakroborty and A. Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2003.
4. Pignataro L. J., Traffic Engineering – Theory and Practice, Prentice Hall, 1973.
5. L. R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2000.

**Reference Books**

1. Roger P. Roess, William R. McShane & Elena S. Prassas, Traffic Engineering, Prentice-Hall, 1990.
2. Highway Capacity Manual (HCM), Transportation Research Board, USA, 2000.
3. Wohl M. and Martin B. V., Traffic System Analysis, McGraw-Hill Book Company, 1967.
4. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan Press Ltd. 1996.



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**Multidisciplinary Minor-V**

|                 |            |                                         |              |                  |
|-----------------|------------|-----------------------------------------|--------------|------------------|
| <b>23CEMDA5</b> | <b>MDM</b> | <b>A) Contract Accounts and Tenders</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|-----------------|------------|-----------------------------------------|--------------|------------------|

|                         |                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                                                   |
| Lecture: 3 hrs/week     | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

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

|            |                                                                        |
|------------|------------------------------------------------------------------------|
| <b>CO1</b> | Explain the method of PWD for initiating work.                         |
| <b>CO2</b> | Identify the contract for civil engineering works.                     |
| <b>CO3</b> | Explain the contract system for civil engineering work.                |
| <b>CO4</b> | Demonstrate the ability to manage execution of construction contracts. |
| <b>CO5</b> | Construct the tender for civil engineering works.                      |
| <b>CO6</b> | Apply arbitration act for civil engineering work.                      |

**Course Content:**

|                                                                                                                                                                                                                                                                                         |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Public work Account</b><br>Introduction, organizational structure of PWD, functions of PWD, administrative approval, methods used in PWD for carrying out work                                                                                                               | <b>[04]</b> |
| <b>Unit 2: Contracts</b><br>Contract, Objects of contract, requirements of valid contract, Overview of Indian contract Act 1872, types of engineering contract, dispute in contract, international contract.                                                                            | <b>[06]</b> |
| <b>Unit 3: Contract System</b><br>Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor in PWD, condition of contract, rights of contractor                                                                                | <b>[05]</b> |
| <b>Unit 4: Execution and Management of Contracts</b><br>Site organization, Measurement Book (MB), Running Account (RA) bills, Final bill preparation, Variations and extra items, Escalation and price adjustment clauses                                                               | <b>[04]</b> |
| <b>Unit 5: Tender and tender Document</b><br>Tender, types of tender, tender form, tender document, tender notice, time limits for tender notice, acceptance and rejection of tender, engineering tender documents, concept of e-tendering                                              | <b>[05]</b> |
| <b>Unit 6: Arbitration</b><br>Arbitration, need for arbitration, arbitrator, qualification of arbitrator, different kind of arbitration according to arbitration act, procedure of settlement of dispute in contract, action taken by departmental officer in charge, arbitration award | <b>[06]</b> |



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**Text Books:**

1. Gupta, R.P. (2015) "Contracts, Accounts and Tenders in Construction Industry," Nem Chand & Bros, Roorkee
2. Raghunath, S. (2013) "Construction Contracts and Accounts: An Indian Perspective," Charotar Publishing House Pvt. Ltd., Anand
3. Bandyopadhyay, K.K. (2017) "Contracts, Accounts and Tenders in Construction Management," New Central Book Agency, Kolkata
4. Mukhopadhyay, A.K. (2019) "Construction Contracts and Tenders: Theory and Practice," Oxford University Press, New Delhi
5. Ghosh, S.K. (2014) "Contracts, Accounts and Tenders in Civil Engineering," PHI Learning Pvt. Ltd., New Delhi

**Reference Books**

1. P N datta; Estimating and costing in civil engineering, USB Publication, New Delhi
2. Chakraborti M; Estimating costing specification and valuation; ISBN, Kolkata.
3. Raina V K ; Construction management and contract practices , Shroff publisher, New Delhi
4. Patil B S; civil engineering contracts and estimates; Orientlongman, Mumbai.



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**Multidisciplinary Minor-V**

|                 |            |                                            |              |                  |
|-----------------|------------|--------------------------------------------|--------------|------------------|
| <b>23CEMDB5</b> | <b>MDM</b> | <b>B) Professional Practice and Ethics</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|-----------------|------------|--------------------------------------------|--------------|------------------|

|                         |                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                                                   |
| Lecture: 3 hrs/week     | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

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

|            |                                                                                                 |
|------------|-------------------------------------------------------------------------------------------------|
| <b>CO1</b> | Explain the roles and responsibilities of different stakeholders in civil engineering practice. |
| <b>CO2</b> | Apply ethical principles and understand professional behavior in engineering.                   |
| <b>CO3</b> | Apply principles of Public Accountability & Engineering Governance                              |
| <b>CO4</b> | Interpret Construction Claims, Risk and Dispute Resolution.                                     |
| <b>CO5</b> | Apply the labour laws and construction-related regulations to civil to Maintain Sustainability  |
| <b>CO6</b> | Illustrate intellectual property rights and their importance in engineering innovation. .       |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Professional Practice &amp; Stakeholders</b><br>Government Bodies: Regulatory authorities, safety norms (e.g., CPWD, MoRTH), Standardization Bodies: BIS, IRC – setting technical standards, Professional Bodies: IEI, IRC, IIA, COA, ECI – certification, training, professional interaction, Clients/Owners: Role based on contracts, Developers: Governed by real estate regulations (e.g., RERA), Consultants: Functioning under guidelines from CEAI and similar bodies, Contractors: Governed by legal contracts and construction laws | <b>[06]</b> |
| <b>Unit 2: Professional Ethics</b><br>Definition and types: Ethics, Engineering Ethics, Business Ethics, Personal Ethics, Code of Ethics (Institution of Engineers, India) Concepts: Profession and Professionalism, Professional Responsibility and Accountability, Conflict of Interest, Environmental Negligence, Distinction: Gift vs Bribe, Real-life ethical dilemmas and case studies                                                                                                                                                            | <b>[06]</b> |
| <b>Unit 3: Public Accountability and Engineering Governance</b><br>Public Service Ethics in Engineering, Engineering Governance & Administrative Framework- E-tendering process and transparency mechanisms, Anti-Corruption Laws & Ethical Compliance- Prevention of Corruption Act (Overview), Central Vigilance Commission (CVC) guidelines, Vigilance systems and departmental enquiries, Public Procurement & Financial Ethics, Right to Information (RTI) & Transparency                                                                          | <b>[06]</b> |
| <b>Unit 4: Construction Claims, Risk and Dispute Resolution</b><br>Construction claims: Delay, variation, escalation, Risk management in construction projects, Alternative Dispute Resolution (ADR):-Negotiation, Mediation, Conciliation, Dispute Review Boards Overview of Arbitration and Conciliation Act, Role of expert witnesses                                                                                                                                                                                                                | <b>[07]</b> |







|                                                                                                                                                                                                                                                                                                                                                                                                     |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 5: Labour Laws, Safety and Sustainable Construction</b><br>Labour management in construction, Building and Other Construction Workers Act, Industrial Disputes Act, Workmen's Compensation Act, Minimum Wages Act, Construction safety regulations, National Building Code (NBC) safety provisions, Environmental clearance and sustainable construction practices, Green building concepts | [05] |
| <b>Unit 6: Intellectual Property Rights (IPR)</b><br>Meaning and types of IP: Patents, Trademarks, Copyright, Industrial Design, Trade Secrets Copyright Act, 1957-Coverage, computer software, ownership, Infringement, piracy, and remedies, Patent Act, 1970, Application process, PCT (Patent Cooperation Treaty), Rights, duties, duration of patents, Infringement and legal remedies         | [06] |

**Text Books:**

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset.
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash

**Reference Books**

1. Avtarsingh (2002), Law of Contract, Eastern Book Co.
2. Dutt (1994), Indian Contract Act, Eastern Law House
3. Anson W.R. (1979), Law of Contract, Oxford University Press
4. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration



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**Multidisciplinary Minor-V**

|                 |            |                              |              |                  |
|-----------------|------------|------------------------------|--------------|------------------|
| <b>23CEMDC5</b> | <b>MDM</b> | <b>C) Bridge Engineering</b> | <b>3-0-0</b> | <b>3 Credits</b> |
|-----------------|------------|------------------------------|--------------|------------------|

| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture: 3 hrs/week     | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

**Pre-Requisites:** Design of Concrete structure

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

|            |                                                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | Classify bridges and understand their components, functions, and design requirements as per                                     |
| <b>CO2</b> | Analyze and design RCC slab and T-beam bridges using IRC codes.                                                                 |
| <b>CO3</b> | Design steel bridges including plate girders and trusses with consideration for fatigue and joint detailing.                    |
| <b>CO4</b> | Apply principles of prestressed concrete to the design of bridge superstructures.                                               |
| <b>CO5</b> | Design bridge substructure components such as piers, abutments, and foundations considering geotechnical and hydraulic factors. |
| <b>CO6</b> | Recommend suitable construction methods, maintenance strategies, and rehabilitation techniques for various bridge types.        |

**Course Content:**

|                                                                                                                                                                                                                                                                            |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1: Introduction</b><br>Importance and classification of bridges, Components of a bridge, Site selection and geological investigation, Loads on bridges (dead, live, impact, wind, seismic, temperature), AASHTO, IRC, and relevant codes                           | <b>[04]</b> |
| <b>Unit 2: Bridge Design Principles</b><br>Design philosophies: Working Stress, Ultimate Load, Limit State, Load Distribution in bridges, Design of slab bridges (simply supported and continuous), Design of T-beam bridges, Courbon's theory and Guyon - Massonet method | <b>[06]</b> |
| <b>Unit 3: Steel Bridges</b><br>Types of steel bridges (truss, plate girder, suspension), Design of plate girder bridges, Design of connections: bolted and welded, Design of bearings and expansion joints, Fatigue considerations in steel bridges                       | <b>[07]</b> |
| <b>Unit 4: Prestressed Concrete Bridges</b><br>Principles of prestressing, Types of prestressing: pre-tensioning and post-tensioning, Design of prestressed concrete slab and girder bridges, Losses in prestress, Cable profiles and tendon layouts                       | <b>[07]</b> |
| <b>Unit 5: Substructure and Foundation Design</b><br>Types of bridge piers and abutments, Design of piers and abutments, Design of open, pile, and well foundations, Scour and hydraulic considerations, Earth pressure theories and wing walls                            | <b>[07]</b> |



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**Unit 6: Construction and Maintenance of Bridges**

Methods of bridge construction (cast-in-situ, precast, segmental), Launching techniques for superstructure, Inspection, maintenance, and rehabilitation of bridges, Health monitoring systems for bridges, Case studies of bridge failures

[05]

**Text Books:**

1. Bridge Engineering by S.P. Bindra
2. Design of Bridges by Krishna Raju
3. Essentials of Bridge Engineering by D. Johnson Victor
4. "Bridge Engineering" – Ponnuswamy S.

**Reference Books**

1. IRC codes, AASHTO LRFD Bridge Design Specifications
2. "Concrete Bridge Practice: Construction, Maintenance and Rehabilitation" – V.K. Raina
3. "Design of Steel Structures" – Subramanian N.
4. "Prestressed Concrete" – Krishna Raju / N. Rajagopalan
5. AASHTO LRFD Bridge Design Specifications
6. IS:456 – Code of Practice for Plain and Reinforced Concrete



*(Signature)*

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**Estimation and Costing Laboratory**

|          |      |                                   |       |           |
|----------|------|-----------------------------------|-------|-----------|
| 23CE4705 | VSEC | Estimation and Costing Laboratory | 0-0-2 | 1 Credits |
|----------|------|-----------------------------------|-------|-----------|

|                         |                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>                                                                                   |
| Practical: 2 hr/week    | Continuous Assessment -I : 15 Marks<br>Continuous Assessment -II : 15 Marks<br>End Semester Exam : 20 Marks |

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

|     |                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | Interpret architectural and structural plans of a residential building and compute the required quantities for various construction items                         |
| CO2 | Apply different approximate estimation techniques                                                                                                                 |
| CO3 | Develop a comprehensive detailed estimate and abstract of cost for a small-scale building project by calculating item-wise quantities and applying current rates. |
| CO4 | Determine rate analysis for selected construction items by breaking down labor, material, equipment, and overhead costs to determine unit rates.                  |
| CO5 | Develop general and detailed technical specifications for major construction works, ensuring compliance with IS codes and standard practices.                     |
| CO6 | Develop standard tender documents for construction works and carry out building valuation using any method and depreciation calculations using standard methods.  |

**Course Content:**

|                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Calculate quantities for earthwork, brickwork, concrete, and plastering from a simple G+0 residential plan.                                                                                                                    |
| 2. Estimate the cost of a residential building using <ul style="list-style-type: none"> <li>• Plinth area method</li> <li>• Cubic rate method</li> <li>• Bay method</li> </ul>                                                    |
| 3. Prepare a <b>detailed estimate</b> and <b>abstract of cost</b> for a small building project including: <ul style="list-style-type: none"> <li>• Earthwork</li> <li>• Brickwork</li> <li>• RCC</li> <li>• Plastering</li> </ul> |
| 4. Conduct rate analysis for any <b>two items</b> out of: <ul style="list-style-type: none"> <li>• Earthwork</li> <li>• PCC</li> <li>• RCC</li> <li>• Brickwork</li> <li>• Plastering</li> </ul>                                  |



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- Flooring
- 5. **Part A.** General specifications for earthwork, concrete, and brickwork  
**Part B.** Detailed specifications for any two items like brick masonry and plastering.
- 6. **Part A.** Draft a sample Tender Document (NIT, Tender Form, and Comparative Statement)  
**Part B.** Carry out a valuation using the any method and calculate depreciation by Straight Line and Sinking Fund Method for a simple building.

**Text Books:**

1. B.N. Dutta – Estimating and Costing in Civil Engineering, UBSPublishers
2. M. Chakraborti – Estimating, Costing, Specification and Valuation in Civil Engineering, Laxmi Publications
3. G.S. Birdie– A Textbook of Estimating and Costing, DhanpatRai Publishing
4. S.C. Rangwala – Estimating, Costing and Valuation, Charotar Publishing House

**Reference Books:**

1. National Building Code of India (NBC) – Bureau of Indian Standards
2. Standard Schedule of Rates (SSR) – CPWD/PWD Publications
3. IS:1200 series – Indian Standard Methods of Measurement of Building Works
4. P.W.D. Handbook – Respective State PWD Guidelines



  
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**Structural Design and Drawing – II Laboratory**

|          |      |                                               |       |           |
|----------|------|-----------------------------------------------|-------|-----------|
| 23CE4706 | VSEC | Structural Design and Drawing – II Laboratory | 0-0-2 | 1 Credits |
|----------|------|-----------------------------------------------|-------|-----------|

| Teaching Scheme:     | Evaluation Scheme:                                                                                          |
|----------------------|-------------------------------------------------------------------------------------------------------------|
| Practical: 2 hr/week | Continuous Assessment -I : 15 Marks<br>Continuous Assessment -II : 15 Marks<br>End Semester Exam : 20 Marks |

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

|     |                                                              |
|-----|--------------------------------------------------------------|
| CO1 | Analysis and design of RCC building.                         |
| CO2 | Analysis and design water tank/ retaining wall/Foundation.   |
| CO3 | To develop the detailed drawing for different RCC structures |

**Course Content:**

The lab work shall consist of detailed design & drawing of the following R. C. structures by Limit State method unless specified.

1. Residential G+2 storey building
2. Any ONE from following
  - a) Circular water tank resting on ground with rigid base. (by working stress method)
  - b) Retaining wall (cantilever or counter fort type)
  - c) Combined footing/ raft foundation/ pile foundation.

**Note:**

- Computer analysis of any one frame for project No.1 shall be performed for Dead Load, Live Load & Earthquake Loads using relevant application software.
- Drawings prepared shall indicate ductility details as per the provision in IS: 13920.

**Text books:**

1. Limit state theory and Design –Karve and Shah , Structures publications , Pune.
2. Limit State Design of reinforced concrete P.C. Varghese, Prentice Hall, New Delhi.
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee.

**Reference books:**

1. IS 456-2000, Plain And Reinforced Concrete - Code Of Practice
2. IS 1343 (1980): Code of Practice for Prestressed Concrete
3. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi.
4. Reinforced Concrete Design-M. L. Gambhir- Mcmillan India Ltd. New Delhi.



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**Research Methodology**

|          |     |                      |       |           |
|----------|-----|----------------------|-------|-----------|
| 23CE4707 | ELC | Research Methodology | 3-0-0 | 3 Credits |
|----------|-----|----------------------|-------|-----------|

| Teaching Scheme:   | Evaluation Scheme:                                                                                                                          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Lecture: 4hrs/week | Continuous Assessment -I : 10 Marks<br>Continuous Assessment -II : 10 Marks<br>Mid Semester Exam : 30 Marks<br>End Semester Exam : 50 Marks |

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

|     |                                                                                    |
|-----|------------------------------------------------------------------------------------|
| CO1 | Explain the concept, scope, and types of research.                                 |
| CO2 | Identify appropriate research designs based on specific research problems.         |
| CO3 | Identify suitable data collection and analysis methods.                            |
| CO4 | Develop a structured and impactful research report.                                |
| CO5 | Interpret ethical guidelines in conducting and reporting research.                 |
| CO6 | Utilize research tools effectively for conducting systematic and ethical research. |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                                     |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 1: Introduction to Research</b><br>Definition and significance of research, Types of research and research process, Identification of research problem, Emerging trends in research, Applications of research in academia and industry.                                                                                                                                     | [06] |
| <b>Unit 2: Research Design</b><br>Defining and formulating the research problem; Types of research design approaches and their pros and cons; Selecting the research problem and understanding the necessity of its clear definition; Importance of literature review in research design.                                                                                           | [06] |
| <b>Unit 3: Data Collection and Analysis</b><br><b>Primary data collection methods:</b> Surveys, interviews, field observations, Numerical and experimental.<br><b>Secondary data collection methods:</b> Existing literature, reports, case studies, and databases.<br><b>Data processing:</b> Handling missing data, filtering unwanted data, and preparing datasets for analysis. | [07] |
| <b>Unit 4: Research Reporting and Presentation</b><br>Structure of a research report: Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References, Referencing styles, Visual representation of data (tables, charts, graphs), Tips for effective research presentations, Oral presentation – Planning – Preparation.                                   | [06] |
| <b>Unit 5: Ethics in Research</b><br>Meaning and importance of research ethics; Plagiarism – definition and different forms; Consequences of plagiarism; Unintentional plagiarism and how to avoid it; Copyright infringement and intellectual property rights; Ethical issues in collaborative research work; Qualities and responsibilities of a good researcher.                 | [05] |



  
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**Unit 6: Tools for Research**

Role of computers in research; Reference organization tools; Tabulation and graphical presentation tools; Web search tools for academic research; Introduction to Artificial Intelligence (AI) tools in research.

**[06]****Text books:**

1. C.R. Kothari – Research Methodology: Methods and Techniques.
2. Ranjit Kumar – Research Methodology: A Step-by-Step Guide for Beginners

**Reference books:**

1. Hamdy A. Taha- Principles of operations research: An Introduction.
2. Ravindran, Phillips, Solberg-Operations Research: Principles and Practice



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| Value and Ethics |     |                   |       |       |
|------------------|-----|-------------------|-------|-------|
| 23CE4708         | VEC | Values and Ethics | 2-0-0 | Audit |

|                         |                                      |
|-------------------------|--------------------------------------|
| <b>Teaching Scheme:</b> | <b>Evaluation Scheme:</b>            |
| Lecture: 2hrs/week      | Continuous Assessment -I : 25 Marks  |
|                         | Continuous Assessment -II : 25 Marks |

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

|            |                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | Interpret the principles of ethics and human values by examining their influence on personal behavior, public conduct, and value formation through family, society, and education. |
| <b>CO2</b> | Demonstrate improved attitude, morals, aptitude, and integrity in contributing positively to society                                                                               |
| <b>CO3</b> | Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.                   |
| <b>CO4</b> | Explain the significance of value inputs in a classroom and start applying them in their life and profession.                                                                      |
| <b>CO5</b> | Analyze publication ethics and misconduct to ensure adherence to ethical standards, authorship guidelines, and responsible research dissemination.                                 |
| <b>CO6</b> | Evaluate the role of ethics, professional values, and gender sensitization in promoting responsible and equitable conduct in engineering and public life.                          |

**Course Content:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Unit 1 Ethics and Human Interface</b><br>Ethics and Human Interface, Essence, determinants and consequences of Ethics in human actions; Dimensions of ethics; ethics in private and public relationships Human Values – lessons from the lives and teachings of great leaders, reformers and administrators, Role of family, society in inculcating values, role of educational institutions in inculcating values.                                                                                                                                                                      | <b>[04]</b> |
| <b>Unit 2: Attitude, Morals, Aptitude, Integrity towards Society</b><br>Attitude: content, structure, function, Attitude and its influence and relation with thought and behavior, Aptitude and foundational values towards society , integrity, impartiality and non-partisanship, objectivity, dedication towards society, empathy, tolerance and compassion intelligence-concepts, and their utilities and application.                                                                                                                                                                  | <b>[04]</b> |
| <b>Unit 3: Understanding Harmony in the Human Being - Harmony in Myself</b><br>Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya, Understanding harmony in the Family. | <b>[04]</b> |



  
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Unit 4: Value Education:</b><br>Need, Guidelines, content and process for Value Education, Self-Exploration–; Natural Acceptance and Experiential Validation, Continuous Happiness and Prosperity, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.                                      | [04] |
| <b>Unit 5: Publication Ethics</b><br>Publication Ethics: Introduction, Scope & importance, Best practices/standards initiatives & Guidelines: COPE, WAME, etc., Conflict of Interest,<br>Publication Misconduct: definition, concept, problems that lead to unethical behavior & Vice versa, Violation of Publication Ethics, Authorship & Contributor ship, Identification of Publication misconduct, complaints & appeals, Predatory publishers & Journals. | [04] |
| <b>Unit 6: Ethics and Gender Sensitization</b><br>Ethics - Meaning, Importance, & Types of Ethics, Values and Attitudes of Professional Engineers, Seven Principles of Public Life.<br>Gender Sensitization: Introduction, Sex vs. Gender, Social construction of Gender, Gender Roles, Gender Stereotypes, Ending violence against girls/ women: Advancing safety and rights, Gender Equality.                                                               | [05] |

**Text Books:**

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
3. Neeraj Kumar, "Lexicon for Ethics, Integrity & Aptitude", Chronicle Publication, 2016.
4. SantoshAjmera, NandKishor Reddi, "Ethics - Integrity and Aptitude", Tata McGraw Hill Publication, 2014.
5. M. Karthikeyan "Ethics, Integrity and Aptitude", Tata McGraw Hill Publication, 2015.
6. Dr. Vara Lakshmi G, Dr. R V Anuradha, "Gender Sensitization", Neelkamal Publications.

**Reference Books:**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
2. A N Tripathy, 2003, Human Values, New Age International Publishers.
3. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
4. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
5. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
6. P L Dhar, R R Gaur, 1990, Science and Humanism, Commonwealth Publishers.







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**Industrial Case Study (Research Seminar)**

|          |    |                                          |       |           |
|----------|----|------------------------------------------|-------|-----------|
| 23CE4709 | RM | Industrial Case Study (Research Seminar) | 0-0-2 | 1 Credits |
|----------|----|------------------------------------------|-------|-----------|

|                                                 |                                                                                                          |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>Practical: 2hrs/week | <b>Evaluation Scheme:</b><br>Continuous Assessment -I : 25 Marks<br>Continuous Assessment -II : 25 Marks |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------|

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

|     |                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------|
| CO1 | Identify technical and practical issues related to the area of course specialization.                             |
| CO2 | Plan a well-organized case studies report employing elements of technical writing and critical thinking.          |
| CO3 | Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting. |

**Course Content**

The civil Engineering Cases group believes that through industrial case studies, students will improve their ability to learn and retain concepts in their courses, on work terms and in their professional lives. One of the best means to create case studies is by converting them from student-generated work reports. As a result, it is in our best interest to ensure that work reports submitted to our group contain an adequate design process and topics that align with topics that professors have suggested would benefit from case studies. We also believe that students will benefit by having suggestions for work term report topics

The student has to select a Seminar topic/Case Studies work based on topic of interest. Periodically the implementation will be evaluated by the project guide. The work starts after sixth semester and evaluated in the seventh semester. The end of each semester student will be evaluated by departmental committee/faculty assigned by HOD.

Students are suggested to choose seminar/ case study areas in following areas

**1. Structural Engineering**

1. Structural failures due to design errors, construction defects, or inadequate materials.
2. Aging infrastructure and the need for maintenance, repair, and rehabilitation of existing structures.
3. Seismic vulnerability in earthquake-prone regions.

**2. Geotechnical Engineering**

1. Soil instability and settlement leading to foundation failures.
2. Slope stability issues, which can result in landslides and soil erosion.
3. Soil liquefaction during earthquakes, which can cause significant damage to structures.

**3. Transportation Engineering**

1. Traffic congestion and the need for efficient traffic management systems.



  
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2. Aging transportation infrastructure, including roads, bridges, and public transit systems.
  3. Integrating sustainable transportation solutions to reduce environmental impact.
  4. **Water Resources Engineering**
    1. Water scarcity and the need for efficient water management and distribution systems.
    2. Flood management and protection against water-related disasters.
    3. Pollution and water quality issues, including water treatment and wastewater management.
  5. **Environmental Engineering**
    1. Air pollution and the need for effective air quality control measures.
    2. Solid waste management and recycling to reduce environmental impact.
    3. Contamination of soil and groundwater, requiring remediation and cleanup strategies.
  6. **Construction Engineering and Management**
    1. Project delays and cost overruns due to poor planning and execution.
    2. Safety issues and accidents at construction sites.
    3. Managing complex construction projects with multiple stakeholders and interests.
  7. **Materials Engineering**
    1. Research and development of innovative materials for sustainable and resilient construction.
    2. Ensuring the quality and durability of materials used in construction projects.
    3. Recycling and reusing construction materials to reduce waste.
- Apart from this students can choose any topic which is relevant to industry**



  
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**Mega Project Phase -II**

|          |     |                        |       |           |
|----------|-----|------------------------|-------|-----------|
| 23CE4710 | ELC | Mega Project Phase -II | 0-0-4 | 4 Credits |
|----------|-----|------------------------|-------|-----------|

|                                                 |                                                                                                                                          |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>Practical: 8hrs/week | <b>Evaluation Scheme:</b><br>Continuous Assessment -I : 25 Marks<br>Continuous Assessment -II : 25 Marks<br>End Semester Exam : 50 Marks |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|

**Course Content**

Since Mega Project Phase-II is in continuation to Mega Project Phase-I, the students are expected to complete the total project by the end of semester VII. After completion of project work, they are expected to submit the project report including the work done in Phase-I and Phase-II.

The report shall be comprehensive and presented typed on A4 size sheets and **hard bound**. The number of copies to be submitted is number of students plus two. The assessment would be carried out by the panel of examiners (Guide and Project Evaluation Members) for both, term work and oral examinations.

The project work should be published in any one of the national/international quality conference or reputed journal.

Report shall summarize the literature survey; spell out the scope of work, methodology and results. Viva-voce Examination shall be based on work carried out by the student



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