COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

First Year

First Semester

Paper Code	Subject
MFC1	Numerical Methods in Civil Engineering
MFC2	Applied Elasticity & Plasticity
MFC3	Behaviour & Design of reinforced Concrete Structure
MFC4	Pavement Material

Syllabus

MFC1 : NUMERICAL METHODS IN CIVIL ENGINEERING

1. INTRODUCTION TO NUMERICAL COMPUTING
Introduction, Objective , Numeric Data, Anolog Computing , Digital Computing , Process Of Numerical Computing , Characteristics Of Numerical Computing , Numercal Stability, Efficiency , Computational Environment, Summary

2. INTRODUCTION TO COMPUTERS AND COMPUTING CONCEPTS
Introduction , Objectives, Evolution Of Numerical Computing And Computers, Modern Computers, Fifth Generation Computers, Types Of Computers , Computing Conceptes, Sub Programs , Intrinsic Functions, Debugging, Testing And Documentation,Summary

3. COMPUTER CODES & ARITHMETICS
Introduction, Objective, Decimal System, Binary Systems, Hexadecimal System, Conversion Of Numbers, Representation Of Number, Octal Hexadecimal Conversion, Computer Arithmatic, Errors In Arithmetic, Laws Of Arithmatic, Summary

4. APPROXIMATIONS AND ERRORS IN COMPUTING
Introduction, Objective, Inherent Errors, Numerical Errors , Truncation Error, Blunders , Absoulute And Relative Errors, Error Propogation , Polynomial Functions, Conditioning And Stability, Convergence Of Iterative Process, Error Estimation, Minimisation The Total Error , Summary

5. ROOTS OF NON-LINEAR EQUATIONS

Introduction, Objective, Methods Of Solutions , Iterative Methods, Starting And Stopping An Iterative Process, Horner's Rule, Bisection Method, False Position Method, False Position Formula, Newton Raphson Method, Limitations Of Newton-Raphson Method, Secant Method, Summary.

6. DIRECT SOLUTION OF LINEAR EQUATION

Need And Scope, Existence Of Solution, Solution By Elimination, Basic Gauss Elimination Method, Gauss Elimination With Pivoting, Gauss – Jordan Method, Tringular Factorisation Methods, Round Off Errors And Refinement, Ill – Conditioned System , Matrix Inversion Method, Summary

7. ITERATIVE SOLUTION OF LINEAR EQUATIONS

Need And Scope, Jacobi Iteration Method, Gauss – Seidel Method, Method Of Relaxation, Convergence Of Iteration Methods

8. NUMERICAL DIFFERENTIATION

Introduction, Objective, Forward Difference Quotient , Central Difference Quotient, Error Analysis , Higher Order Derivatives, Differentiating Tabulated Funtion, Summary

9. NUMERICAL INTEGRATION

Introduction, Objective, Newton-Cotes Integration Formulae, Numerical Integration, Simpson's 1/3-Rule, Simpson's 3/8-Rule, Romberg Integration,

10. NUMERICAL SOLUTION OF ORDINARYDIFFERENTIAL EQUATION

Introduction, Solution By Taylor's Series, Picard's Method Of Successive Approximation, Euler's Method, Eror Estimates For The Euler Method, Runge-Kutta Methods, Predictor-Corrector Methods, Summary

11. BOUNDRY VALUE AND EIGEN VALUE PROBLEMS

Introduction, Objective, Shooting Method, Finite Difference Method, Solving Eigenvalue Problems , Evaluating The Eignvalue, Power Method

12. SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

Need and Scope, Deriving Difference Equations, Elliptic Equations, Parabolic Equations, Hyperbolic Equations, Summary

MFC2 APPLIED ELASTICITY & PLASTICITY

1. **BASIC EQUATIONS OF ELASTICITY**
   Introduction, The State of Stress at a Point, The State of Strain at a Point, Basic Equations of Elasticity, Methods of Solution of Elasticity Problems, Plane Stress, Plane Strain, Spherical Co-ordinates, Computer Program for Principal Stresses and Principal Planes.

2. **TWO-DIMENSIONAL PROBLEMS IN CARTESIAN CO-ORDINATES**
   Introduction, Airy's Stress Function – Polynomials : Bending of a cantilever loaded at the end ; Bending of a beam by uniform load, Direct method for determining Airy polynomial : Cantilever having Udl and concentrated load of the free end; Simply supported rectangular beam under a triangular load, Fourier Series, Complex Potentials, Cauchy Integral Method , Fourier Transform Method, Real Potential Methods.

3. **TWO-DIMENSIONAL PROBLEMS IN POLAR CO-ORDINATES**

Basic equations, Biharmonic equation, Solution of Biharmonic Equation for Axial Symmetry, General Solution of Biharmonic Equation, Saint Venant's Principle, Thick Cylinder, Rotating Disc on cylinder, Stress-concentration due to a Circular Hole in a Stressed Plate (Kirsch Problem), Saint Venant's Principle, Bending of a Curved Bar by a Force at the End.

4. **TORSION OF PRISMATIC BARS**
   Introduction, St. Venant's Theory, Torsion of Hollow Cross-sections, Torsion of thin-walled tubes, Torsion of Hollow Bars, Analogous Methods, Torsion of Bars of Variable Diameter.

5. **BENDING OF PRISMATIC BASE**
   Introduction, Simple Bending, Unsymmetrical Bending, Shear Centre, Solution of Bending of Bars by Harmonic Functions, Solution of Bending Problems by Soap-Film Method.

6. **BENDING OF PLATES**
   Introduction, Cylindrical Bending of Rectangular Plates, Slope and Curvatures, Lagrange Equilibrium Equation, Determination of Bending and Twisting Moments on any plane, Membrane Analogy for Bending of a Plate, Symmetrical Bending of a Circular Plate, Navier's Solution for simply supported Rectangular Plates, Combined Bending and Stretching of Rectangular Plates.

7. **THIN SHELLS**
   Introduction, The Equilibrium Equations, Membrane Theory of Shells, Geometry of Shells of Revolution.

8. **NUMERICAL AND ENERGY METHODS**
   Rayleigh's Method, Rayleigh – Ritz Method, Finite Difference Method, Finite Element Method.

9. **HERTZ'S CONTACT STRESSES**
   Introduction, Pressure between Two-Bodies in contact, Pressure between two-Spherical Bodies in contact, Contact Pressure between two parallel cylinders, Stresses along the load axis, Stresses for two Bodies in line contact Exercises.

10. **STRESS CONCENTRATION PROBLEMS**
    Introduction, Stress-Concentration Factor, Fatigue Stress-Concentration Factors.

MFC3 : BEHAVIOUR & DESIGN OF CONCRETE STRUCTURES

1. **REINFORCED CONCRETE MATERIALS**
   Introduction, Cement – Chemical Composition of Cement; Types of Cement; Physical Properties of Cement, Aggregate – Classification of Aggregates; Physical Properties of Aggregates, Water, Admixtures, Concrete – Plastic Concrete; Hardened Concrete, Concrete Mix Design – Nominal Concrete Mix; Designed Concrete Mix, Reinforcing Steel.

2. **DESIGN CONCEPTS**
   Design Concepts, Design Methods – Working Stress Methods; Limit State Method, Characteristic Strength and Load.

3. **FLEXURE**
   Introduction, Behaviour of Beam Under Load, Design Methods, Working Stress Method – Assumptions; istribution of Stresses and Transformed Area; Analysis and Design of Beam Sections; Analysis and Design of Rectangular Beam Sections; Analysis and Design of Flanged Beam Section, Limit State

Method – Assumptions; Analysis and Design of Beam Sections; Analysis and Design of Rectangular Beam Sections; Analysis and Design of Flanged Beam Section.

4. **SHEAR, TORSION AND BOND**
   Shear – Introduction; Shear Stress; Behaviour of Beam without Shear Reinforcement; Shear Strength of Concrete in Beam; Mechanism of Shear Resistance with Shear Reinforcement; Shear Strength of Shear Reinforcement; Design of Beam for Shear, Torsion – Introduction; Torsional Stresses; Strength of Plain Concrete Beam in Torision; Strength of Reinforced Concrete Beams in Torision; Interaction of Torsion with Flexure and Shear; Design for Torsion Combined with Flexure and Shear, Bond – Introduction; Mechanism of Bond Failure; Bond Stress; Development Length; Curtailment of Reinforcement; Splices.

5. **BEAMS**
   Introduction, Rectangular and Flanged Beams, Analysis of Beams, Design of Beams – Design for Serviceability Requirements; Design for Strength Requirements, Reinforcement Detailing for Beams – Flexural Reinforcement Detailing; Shear Reinforcement Detailing; Torsion Reinforcement Detailing, Lintels, Deep Beams.

6. **SLABS**
   Introduction, Edge Supported Slabs – Introduction; Behaviour of Edge Supported Slabs; Analysis of Edge Supported Slabs; Design of Edge Supported Slabs; Reinforcement Detailing for Edge Supported Slabs, Flat Slab – Introduction; Behaviour of Flat Slab; Analysis of a Flat Slab; Design of a Flat Slab; Reinforcement Detailing for Flat Slab; Waffle Slabs.

7. **COLUMNS**
   Introduction, Behaviour of Columns Under Load, Design Approach, Design of Column Section – Working Stress Method; Limit State Method, Design of Column Element – Short and Long Columns; Design of Columns; Reinforcement Detailing for Columns.

MFC4 PAVEMENT MATERIAL

1. **STONES**
   Sources, Composition of Stones, Classification of Stones, Choice and Uses of Stones, Characteristics of Good Stones, Testing Stones, Stone Destroying Agents, Preservation of Stones, Stone Quarrying, Dressing and Polishing of Stones, Stone Quarries in India, Commonly Used Stones, Composition; Characteristics and use of Various Stones, Artificial Stones.

2. **BRICKS**
   Introduction, Classification of Bricks, Uses of Bricks, Composition of Brick Earth, Classification of Brick Earth, Useful and Harmful Ingredients in Brick Earth, Properties of Good Brick Earth, Analysis of a Few Brick Earths, Test of Brick Earth, Brick Field, Manufacture of Bricks, Strength of Bricks, Sizes and weigths of Bricks, Tests for Good Bricks, Special Forms of Bricks, Fire Clay and Fire Bricks, Classification of Refractory Bricks, Strength of Refractory Bricks, Colour of Bricks.

3. **TILES, TERRA –COTTA, EARTHENWARE AND STONEWARE**
   Tiles, Terra –Cotta, Earthenware and Stonewares.

4. **LIME, CEMENT, SAND AND SURKI**
   Lime, Cement, sand , Surki

5. MORTAR AND CONCRETE

Mortar, Properties of a Good Mortar, Uses of mortars, Function of Sand and Surki in Mortar, Effect of Clay in Mortar, Effect of Quantity of Water in Mortar, Composition of Mortar, Specifications of Ingredients for Mortar, Classification of Mortar, Comparative Strength of Lime and Cement Mortars, Addition of Small Quantities of Cement to a Lime Mortar, Addition of Small Quantities of Lime to a Cement Mortar, Use of Molasses in Mortar, Gauged Mortar, Light-Weight Mortar, Fire-Resisting Mortar, Water-Resisting Mortar, Mud Mortar, Precautions in Using Mortar, Introduction to Concrete, Historical Review in Brief, Uses of Concrete, Materials for Concrete, Classification of Concrete, Proportioning Ingredients for Concrete, Mix Design Computations, Mixing of Ingredients for Lime Concrete, Laying Lime Concrete, Mixing of Ingredients for Cement Concrete, Laying Cement Concrete, Placing Concrete Under Water, Consolidating Concrete, Construction Joints in Concrete, Finishing Concrete, Special Types of Concrete, Strength and Properties of Concrete, Curing of Concrete , Water-Cement Ratio, Consistency of Concrete, Maximum Allowable Slumps for Various Concrete Works, Strength of Concrete with Age, Shrinkage of Concrete, Temperature Effect on Concrete.

6. TIMBER

Definition, Classification and growth of Trees, Structure of a Timber Tree, Time for Felling a Timber Tree, Characteristics of Good Timber, Defects in Timber, Diseases of Timber, Decay in Timber, Destruction of Timber By Insects and Worms, Seasoning of Timber, Preservation of Timber, Protection of Timber From Fire, Market Forms of Timber, Conversion of Timber, Timber Beams and Floor Boards, Advantages of Timber Construction, Disadvantages of Timber Construction, Timbers Suitable for Various Uses, Veneers; Lamin Boards, Batten Boards; Plywoods and Fibre Boards, Destruction of Plants and shrubs Growing on Buildings, Protection of Timber against Worms and Insects.

7. PAINTS AND VARNISHES

Uses of Paints, classification of Paints, Constituents of Paints, Materials Used in Paints, Covering Power of Paints, Characteristics of a Good Paint, Preparation of Paints, Application of Paints, Painting New Woodwork, Painting Brickwork, Painting New Ironwork, Painting Plastered Surface, Painting Over Oldwork, Spray Painting, Defects in Painting, Destroying Agents of Paints, Various Paints, Uses of Varnish, Ingredients of Varnish, Different Kinds of Varnish, Polishes, Characteristics of a Good Varnish, Recipes for Oil Varnish, Recipes for Spirit Varnish, Recipes for Turpentine Varnish, Recipes for Polishes, Recipes for Lacquers.

8. IRON AND STEEL

Introduction, Nomenclature of Iron, Composition and Sources of Iron Ores, Manufacture of Pig Iron, Classification of Pig Iron, Manufacture of Cast Iron, Classification of Cast Iron, Casting in Sand, Examination of Castings, Required Qualities in C.I. Castings, Characteristics and Uses of Cast Iron, Manufacture of Wrought Iron , Composition of Wrought Iron, Defects in Wrought Iron, Characteristics and Uses of Wrought Iron, Manufacture of Steel, Characteristics and Uses of Mild Steel, Classification of Steel, Steel Alloys, Market Forms of Rolled Steel Sections, Defects in Steel Ingots and Steel Castings , Iron-Carbon Constitutional Diagram, Corrosion and Rusting of Iron, Preservation of Iron and Steel, Stress-Strain Curves.

9. NON-FERROUS METALS AND VARIOUS ALLOYS

Aluminium, Copper, Zinc, Lead, Tin, Cadmium, Nickel, Cobalt, Antimony, Bismuth, Magnesium, Manganese, Chromium, Molybdenum, Tungsten, Vanadium , Titanium, Tantalum, Zirconium, Sodium, Potassium, Barium, Calcium, Mercury, Silver, Gold, Platinum, Brass, Bronze, Gun Metal, Bell-Metal, Phosphor-Bronze, Aluminium- Bronze, Aluminium-Brass, Partinium, German Silver, Monel Metal, White Metal, Babbitt's Metal, Pewter.

10. WATER

Introduction, Uses of Water, Water for Industries, Quality of Water, Sources of Water, Water Treatment, Turbidity – Causes and Treatment, Colour - Causes and Treatment, Taste and Odour - Causes and Treatment, Hardness - Causes and Treatment, Demineralisation of Water, pH-Value of Water.

11. MISCELLANEOUS MATERIALS

Asphalt and Bitumen, Tar and its Products, Comparison between Asphalt; Bitumen and Tar, Naphtha, Petroleum, Turpentine, Linseed Oil, Resin; Gum and Balsam, Gelatine; Glue and Size, Putty, Rubber, Gutta Percha , Cork, Gasket, Emery Cloth and Paper, Fibres and Felt, Belts, Ropes, Special Cements, Asbestos, Plaster of Paris, Glass, Abrasives, Refractories, Fuels, Wall and Ceiling Papers, Mica, Lubricants, Plastics, Insulators, Nails, Screws, Pins, Cotters, Keys, Bolts-Nuts , Rivets, Welding.

COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

First Year

Second Semester

Paper Code	Subject
MFC5	Advanced Structural Analysis
MFC6	Geotechnical Engineering
MFC7	Finite Element Method in Engg.
MFC8	Highway Engineering

Syllabus

MFC5 ADVANCED STRUCTURAL ANALYSIS

1. BEAMS ON ELASTIC FOUNDATION:

Introduction , Elastic curve equation, Classification of beams on elastic foundations, Long beams subjected to concentrated load per unit width, More than one loads, Long beams subjected to moment M_0. (a) Long beam carrying triangular load on portion of the beam, (b)Long beam carrying parabolic load on portion of the beam, (c) Long beam subjected to varying load on portion of the beam.

2. CURVED BEAMS:

Beams with small initial curvature, Beams with large initial curvature i.e curved beams Axial and bending loads combined, Limitations on the Winkel Bacth formula, (a) Equivalent area method, Circumferential stress in curved beams having I, T or similar cross- sections, Deflection of curved beams, Close ring subjected to a concentrated load.

3. BEAMS CURVED IN PLAN AND SPACE STRUCTURES:

Introduction, Circular beams loaded uniformly and supported on symmetrically placed columns, Semi-Circular beams simply supported on three supports equally spaced, Quarter circle beam fixed at one end and free at other carrying a load at the free end , Transversely loaded circular beam.

4. FLEXIBILITY METHOD:

Introduction , Method of consistent deformation, Application of flexibility method to pin-jointed, frames, Effects of temperature and prestrain, Displacements and forces in members of indeterminate structures, Flexibility matrix of a plane member.

5. STIFFNESS METHOD:

Relation between slope deflection method and stiffness method, Stiffness method of analysis, Choice between flexibility and stiffness methods, Applications of stiffness method of problems involving relative displacement of supports, Forces in members of indeterminate structures by stiffness method, (a) Application of Stiffness methods to pin- jointed frames

6. ELEMENTS OF THEORY OF ELASTICITY:

Stresses and Strains, Equations of Equilibrium, Compatibility Conditions, Generialised Hooke;s Law, Compliance Matrix, Engineering Constants, Plane Stress and Plane Strain.

7. STRUCTURAL DYNAMICS:

Terms used in the vibration analysis, Simple harmonic motion, Free or natural vibrations, Damping, Mass moment of inertia, Torsional vibrations, Energy, Energy method of vibration analysis, Rayleigh's method, D'Alembert's principle , Mathematical modeling, Two-degree freedom systems undamped loading, Response of viscous – damped SDOF systems to 'armonic excitation, Response to support motion, Force transmitted to the foundation, Seismic instruments of vibrometers, Response to general dynamic loading impulsive loading and Duhamel's integral, Response of undamped oscillatore under constant force, Response of undamped oscillator under rectangular load, Response of an undamped oscillator under triangular load.

8. SANDWICH STRUCTURES:

Sandwich Construction, Sandwich Materials, Properties of Aluminium Honeycomb Cores, Sandwich Structures Design Considerations, Analysis of Sandwich Structures, Bending of Rectangular Plates, Bending of Sandwich Structures.

9. STRESS ANALYSIS OF CRACKS:

Introduction, Griffith Theory, Stress Intensity Factor, Crack Growth Under Fixed Grip vs Fixed Load, Crack Tip Stresses and Displacements, Stress Intensity Factors for Through – the – thickness Cracks in a Sheet, Stress Intensity Factors for Cracks at Holes, Stress Intensity Factors for Through – the –Thickness Cracks in Cylindrical and Spherical Shells.

10. FRACTURE MECHANICS:

Plane Strain and Plane – Stress , Fracture Modes, Plane –Strain Fracture Toughness K_{IC}, Role of Plasticity in Fracture, Crack Opening Displacement, Dugdale Model , Plane Strain Plastic Zone, Shape of Plastic Zone.

MFC6 GEOTECHNICAL ENGINEERING

1 INTRODUCTION

Soil as a three phase system, water content, density and unit weights, specific gravity, voids ratio, porosity and degree of saturation, density index

2 CLASSIFICATION OF SOILS

General, compaction, standard proctor test, equivalent for standard proctor test. [is *: 2720 a* (part vii) : 1965 : light compaction], water-density relationship, modified proctor test, modified proctor test curve, jodhpur mini-compactor test, typical comparison of the standard proctor test and jodhpur mini-compactor test, jodhpur mini-compactor, field compaction methods, field compaction control, proctor needle, calibration curve, factors affecting compaction, effect of compactive effort on compaction, obtained by the jodhpur mini-compactor, shear strength

3 STRESS DISTRIBUTION

Introduction, concentrated force: boussinesq equations, concentrated load: boussinesq, analysis, pressure distribution diagrams, variation of σz with r at constant depth, vertical stress distribution on a horizontal plane (influence diagram for σ_z at a), σ_z distribution on vertical lane, vertical pressure under a uniformly, uniformly distributed load over circular area, vertical pressure due to a line load, vertical pressure under strip load, vertical. Pressure under centre of strip load, vertical pressure under a uniformly loaded rectangular area, rectangular loaded area, influence factor for rectangular area (after steinbrenner), equivalent point load method, newmark's influence chart, radii of concentric circles for influence chart, contact pressure,

4 SURFACE TENSION CAPILLARITY & EFFECTIVE STRESS

Modes of occurrence of water in soil, adsorbed water, adsorbed water and pore water (lambe, 1953), capillary water, surface tension and formation of meniscus, capillary rise, values of unit weight, dynamic viscosity and surface tension for water, capillary heights of soil, stress conditions in soil : effective and neutral pressures, capillary siphoning,

5 PERMEABILITY

Introduction, darcy's law, discharge velocity and seepage velocity, validity of darcy's law, factors affecting permeability, constant head permeability test, falling head , permeability test, permeability of stratified soil deposits,

6 SEEPAGE ANALYSIS

Head gradient and potential, seepage pressure, upward flow : quick condition

Sand condition, two dimensional flow: laplace equation, seepage through anisotropic soil, phreatic line of an earth dam , one dimensionalconsolidation, consolidation of laterally confined soil, semi log plot of pressure voids ratio relationship, consolidation of undisturbed specimen, terzaghi's theory of one dimensional consolidation, calculation of voids ratio and coefficient of volume change, calculation of voids ration by height of solids method, calculation of voids ratio by change in voids ratio method, determination of coefficient of consolidation, shear strength, theoretical considerations : mohr's stress circle, mohr-coulomb failure theory, the effective stress principle, measurement of shear strength, direct shear test, triaxial compression test, vane shear test , shear strength of cohesive soils

7 EARTH PRESSURE

Introduction , plastic equilibrium in soils : active and pasive states, active and passive states of plastic equilibrium, active earth pressure: rankine's throry, backfill with uniform surcharge, active earth pressure of cohesive soils, passive earth pressure : rankine's theory, coulomb's wedge theory

8 DESIGN OF GRAVITY RELATING WALL

Design of gravity relating wall

9 STABILITY OF SLOPES

Introduction, stability analysis of infinite slopes, stability analysis of finite slopes, the swedish slip circle method, stability of slopes of earth dam

10 SUBSOIL EXPLORATION

Introduction, site reconnaissance, site exploration, methods of site exploration, soil samples and samplers, disturbed sampling, undisturbed sampling, penetration and sounding tests, geophysical methods

11 SHALLOW FOUNDATION:

Types of foundations, spread footing, safe bearing pressure, settlement of footings, combined footing and strap footing, mat or raft footing, i.s. Code of practice for design of raft foundations, modulus of subgrade reaction K_s

12 WELL FOUNDATION

Introduction: caissons, shapes of wells and component parts, depth of well foundation and bearing capacity, forces acting on a well foundation, analysis of well foundation,
Heavy wells

MFC7 FINITE ELEMENT METHOD IN ENGINEERING

1. **INTRODUCTION**
   Introduction. Historical Background. Design Considerations. Need Of Finite Element Method. The Process Of Finite Element Method, Field And Boundary Conditions, Steps Involved In Fem, The Standard Discrete System , Transformation Of Co-Ordinates.

2. **FINITE ELEMENTS OF ELASTIC CONTINUUM DISPLACEMENT APPROACH**
   Introduction, Direct Formulation Of Finite Element Characteristic, Generalized Nature Of Displacements, Strains, And Stresses, Generalization To The Whole Region--Internal Nodal Force Concept Abandoned, Displacement Approach As A Minimization Of Total Potential Energy, Convergence Criteria, Discretization Error And Convergence Rate, Displacement Functions With Discontinuity Between Elements--Non-Conforming Elements And The Patch Test, Bound On Strain Energy In A Displacement Formulation, Direct Minimization.

3. **GENERALIZATION OF THE FINITE ELEMENT CONCEPTS WEIGHTED RESIDUAL AND VARIATIONAL APPROACHES**
   Introduction, Weighted Residual Methods, Approximation To Integral Formulations: The Weighted Residual Method, Virtual Work As The 'Weak Form' Of Equilibrium Equations For Analysis Of Solids Or Fluids, Variational Principles, Establishment Of Natural Variational Principles For Linear, Self-Adjoint Differential Equations, Maximum, Minimum, Or A Saddle Point, Constrained Variation Principles, Lagrange Multipliers And Adjoin Functions.

4. **STRAIN PLANE STRESS AND PLANE**
   Introduction, Element Characteristics, Some Practical Applications, Special Treatment Of Plane Strain With An Incompressible Material.

5. **AXI-SYMMETRIC STRESS ANALYSIS**
   Introduction, Element Characteristics, Some Illustrative Examples.

6. **THREE – DIMENSIONAL STRESS ANALYSIS**
   Introduction, Tetrahedral Element Characteristics.

7. **ELEMENT SHAPE FUNCTIONS SOME GENERAL FAMILIES OF C_0 CONTINUITY**
   Introduction, Two – Dimensional Elements, Completeness Of Polynomials, Rectangular Elements – Lagrange Family, Rectangular Elements – 'Serendipity' Family, Triangular Element Family, One-Dimensional Elopements, Three-Dimensional Elements, Other Simple Three-Dimensional Elements.

8. **CURVED, ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION**
   Introduction, Parametric Curvilinear Co-Ordinates, Geometrical Conformability Of Elements, Variation Of The Unknown Function With In Distorted, Curvilinear, Elements, Continuity Requirements, Transformations, Element Matrices, Area And Volume Co-Ordinates, Convergence Of Elements In Curvilinear Co-Ordinates, Numerical Integration.

9. **SOME APPLICATIONS OF ISOPARAMETRIC ELEMENTS IN TWO- AND THREE-DIMENSIONAL STRESS ANALYSIS**
   Introduction, A Computational Advantage Of Numerically Integrated Finite Elements.

MFC8 HIGHWAY ENGINEERING

Section 1: Highway Planning And Administration;

1. TRANSPORTATION IN MODERN SOCIETY:

Transport and Economic Growth, Transport overcomes the separation between the producer and the consumer, Preservation of Quality of Goods, Economies of Scale and Specialization, Exploitation of Natural Resources, Administration, Defense and Strategic Needs, Modes of Transport And Their Characteristics-Need for Coordinate Development, Multi-modal Transport Systems, Use of Information Technology in Transportation.

2. HIGHWAY ADMINISTRATION AND FINANCE:

Roads as Infrastructure for Public Good, Administration of National Highways, Administration of Roads under other Central Ministries, Roads of Inter-state or Economic Importance, National Highways Authority of India (NHAI), Highway Staff Training Institute, National Rural Road Development Agency, Highway Financing and Taxation in India .

Section 2: Geometric Design Of Highways:

3. GEOMETRIC DESIGN:

Design Controls and Criteria: General; Topography; Traffic; Design Vehicle Dimensions; Design speed; Capacity , Horizontal Alignment: Basic formula for movement of vehicles on curves; Maximum super-elevation value; Minimum radii of curves; Transition curves; Widening on curves; General controls for horizontal alignment

Section 3 .Highway Project Preparation:

4. DESIGN , DRAWING, ESTIMATES AND PROJECT REPORT:

Design: Need for assessment of various alternatives; Computer –aided highway design and its advantages; Step involved in design; Stage construction , Drawings: Types of drawings; Locality map-cum-site plan; Land acquisition plans; Plan and longitudinal section; Typical cross-section sheet; Detailed cross –sections; Drawing for cross –drainage structures; Road junction drawings; Drawings for retaining walls and other structures ,Estimates, Earthwork Quantities; Mass diagram, Project Report, Stages In Project Preparation.

Section: 11 Highway Economics:

5. ECONOMICS OF PAVEMENT TYPES:

Basis for Comparison, Period of Analysis, Costs of Initial Construction, Cost of Maintenance , Cost of Vehicle Operation, Equivalence in Thickness.

6. ECONOMIC EVALUATION OF HIGHWAY PROJECTS:

Role of Economic Evaluation., Some Basic Principles , Time Value of Money, Costs and Benefits, Evaluation Techniques: Net present Value (NPV) Method, Benefit- Cost (B/C)Ratio Method; Internal Rate of Return (IRR) Method; Comparison of the Various Methods of Economic Evaluation; Selection of Discount Rate.

Section:13 Construction Management

7. QUALITY ASSURANCE IN HIGHWAY ENGINEERING:

Quality Assurance Vis A Vis Quality Control, Element of Quality Assurance System: General; Assessing Requirement of a Highway Project; Choice of Quality Materials and Design; Development of Specifications and Acceptance Criteria; Choice of Construction Method/ Equipment/ Plant; Inspection and Quality Control; Assessing Quality of Finished Pavement; Periodic Inspection and Maintenance Measures, Inspection and Quality Control During Construction; Preliminary Tests; Preliminary Inspection of Performance of Equipment; Trial Construction; Controlling Workmanship during Construction; Controlling Quality during Control, Statistical Methods in Quality Control: Normal distribution ;Mean; Point Estimate and Interval

Estimate; Control Chart, Acceptance Sampling,Inspection of Finished Pavement: General; Inspection using Sampling Tests; Judgment Using Quality Control Data, Organization for Quality Assurance.

8. CURRENT TRENDS IN HIGHWAY ENGINEERING IN INDIA (2002) AND PROSPECTS FOR THE FUTURE:

Introduction, Road Development Plan-VISION: 2001: Highlights of the VISION: 2021 Document, Expressway Master Plan. Pradhan Mantri Gram Sadak Yojana (PMGSY): Noteworthy Features of the PMGSY; Resources for Implementing PMGSY, Trends in Highway Engineering Practice: Survey and Investigations; Highway Design Software; Pavement Design; New Materials and Specification; Construction; Maintenance; Procurement; Quality Assurance; Research; Urban Roads , Institutional Issues: Background; Ministry of Road Transport and Highways (MoRT& H); National Highways Authority of India (NHAI);PWDs; Rural Engineering Organizations (REOs); Training Policy; Funding Issued, Concluding Remarks.

COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

Second Year

Third Semester

Paper Code	Subject
MSC1	Prestressed Concrete
MSC2	High Rise Structures
MSC3	Planning & Design of Airports
MSC4	Transportation System Planning

SECOND YEAR

IIIrd Semester

MSC1 PRESTRESSED CONCRETE

1. INTRODUCTION TO PRESTRESSED CONCRETE

Introduction, Reinforced Concrete Versus Prestressed Concrete, Prestressing System, Loss Of Prestress, Steel For Prestressing, Basic Concepts Of Prestressed Concrete, Homogeneous Beam Concept, Pressure Line, Load Balancing Concept, Shear And Pricipal Streses

2. SYSTEMS OF PRESTRESSING

Classifications Of Prestressed Concrete Members, Hoyer System, The Freyssinet System, The Magnel Balton System, Gifford Udall System, P.S.C.Monowire System, C.C.L Standards System, LEE-McCall System

3. PRESTRESSED CONCRETE BEAMS

Introduction, Limit State Of Collapse , Limit State Of Collapse In Shear , Limit State Of Serviceability , Prestressed Concrete Poles, Other Design Considerations, Selection Of Sectional Dimensions, Detailing Of Reinforcement, Limits State Of Serviceability For Deflection

4. END BLOCK

Introduction, Magnel's Method, Guyon's Method, Beam With Two Anchor Plates Symmetricaly Placed On The Face Of The Beam , Cable At An Eccentricity

5. PRESTRESSED CIRCULAR TANKS AND PIPES

Introduction, Principles of Circumferencential Prestressing, Methods Of Design

6. SMALL PRESTRESSED CONCRETE DAMS

Introduction, Design Requirements, Design

7. PRESTRESSED CONCRETE PILES

Introduction, Convenient Ways of Lifting A Pile, Maximum Length Of Pile

MSC2 HIGH RISE STRUCTURES

1. MULTISTOREY BUILDINGS
Introduction, Structural Systems For Buildings, Load Bearing Masonry Buildings, Framed Buildings, Selection Of Structural System, Types Of Floors, One-Way Slab Systems, Two Way Slab Systems, Flat Slab Systems, Flat Plate Systems, Grids

2. TYPES OF STAIRS
Introduction, Common Types Of Stairs, Central-Wall Type Stairs, Central-Column Type Stairs, Slabless Stairs, Helicoidal Stairs, Free Standing Stairs

3. MASONRY BUILDINGS
Introduction, Brick Wall Desigh Under Vertical Loads, Brick Wall Under Horizontal Loads, Resistance To Earthquake Forces By Wall Boxes, Loads, Multistorey Buildings, Response Reduction Factor, 2d Analysis, 3d Analysis, Analysis For Vertical Loads

4. FRAMED BUILDINGS UNDER VERTICAL LOADS
Introduction, Frame Analysis Under Vertical Loads, Approximate Analysis By Substitute Frame Method, Interaction At Junction Of Reinforced Concrete Elements, Exact Column Loads And Moments, Apporximate Methods For Column Loads And Moments, Analysis For Lateral Loads, Analysis For Lateral Loads

5. FRAMED BUILDING UNDER HORIZONTAL LOADS
Introduction, Allocation Analysis, Frame Analysis, Torsion In Buildings, Multistorey Buildings

6. SHEAR-WALLED BUILDINGS UNDER HORIZONTAL LOADS
Introduction, Allocation Analysis, Response Of Structure, Effect Of Joint Width, Monolitihic Beam Ot Column Joints

7. SHEAR WALL-FRAME INTERACTION

8. FOUNDATIONS

Introduction, Shallow Foundations, Deep Foundations

MSC3 PLANNING AND DESIGN OF AIRPORTS

1. INTRODUCTION & AIRCRAFT CHARACTERISTICS

Requirements Of Aircraft Types, Field Length Regulations, Restrictions On Payload- Range Performance, Weight Components, Aeroplane Components Parts, Military And Civil Aircrafts, Civil Military Co-Ordination, Classification Of Flying Activity, Relation Of Aircraft To Landing Facility, Aircraft Characteristics, Future Trends In Aircraft Design

2. AIRPORT OBSTRUCTIONS

Zoning Laws, Classification of Obstructions, Turning Zone

3. RUNWAY DESIGN

Runway Orientation, Basic Runway Length, Correction For Elevation, Temperature And Gradient, Airport Classification
Runway Geometric Design

4. AIRPORT CAPACITY AND CONFIGURATION

Airport Capacity, Runway Capacity, Gate Capacity, Taxiway Capacity, Runway Configurations, Runway Intersection Design

5. TAXIWAY DESIGN

Factors Controlling Taxiway Layout, Geometric Design Standards, Exit Taxiways, Fillets, Separation Clearance, Holding Apron, Turnaround or Bypass Taxiway

6. TERMINAL AREA

Building and Building Area, Vehicular Circulation and Parking Area, Apron, Hangar, Blast Considerations, Typical Airport Layouts

7. AIRPORT PLANNING

General, Airport Master Plan, Regional Planning, Data Required Before Site Selection, Airport Site Selection, Surveys For Site Selection, Drawings To Be Prepared, Estimation Of Future Air Traffic Needs

8. STRUCTURAL DESIGN OF AIRPORT PAVEMENTS

Introduction, Various Design Factors, Design Methods For Flexible Pavements, Design Method For Air Field Rigid Pavements, Influence Chart For The Moment Mn In A Concrete Pavement Due To A Load In The Interior Of The Slab, LCN System Of Pavement Design, Joints In Cement Concrete Pavements, Special Consideration For Design Of Pavement Facilities For V/Stol Operations

9. VISUAL AIDS

General, Airport Marking, Airport Lighting

MSC4 TRANSPORTATION SYSTEMS PLANNING

1. HIGHWAY DEVELOPMENT IN INDIA

Roads In Ancient India, Jayakar Committee And The Recommendations, Central Road Fund, Second Twenty Year Road Development Plan 1961-81, Third Twenty Year Road Development Plan 1981-2001, Necessity Of Highway Planning, Classification Of Roads, Methods Of Classification Of Roads, Classification Of Urban Roads, Road Patterns, Planning Surveys, Preparation Of Plans, Reparation Of Master Plan And Its Phasing, Nagpur Road Plan Or First 20-Year Road Plan, Second Twenty Year Road Plan (1961-81), Second Twenty Year Road Plan (1961-81).

2. HIGHWAY ALIGNMENTAND SURVEYS

Requirements, Factors Controlling Alignment, Engineering Surveys For Highway, Locations, Map Study, Reconnaissance, Preliminary Survey, Final Location And Detailed Survey, Drawings And Report, Highway Project, New Highway Project, Route Selection, Materials And Design, Construction, Re-Alignment Project, Necessity Of Re-Alignment, General Principles Of Re-Alignment.

3. HIGHWAY ECONOMICS & FINANCE

Highway User Benefits, Highway Costs, Economic Analysis, Methods Of Analysis, Highway Finance, Distribution Of Highway Cost, Sources Of Revenue Highway Financing In India

4. TRAFFIC ENGINEERING

The Road Users And Their Characteristics, The Vehicles And Vehicular Characteristics, Traffic Census Or Traffic Surveys, Traffic Volume Study, Cyclic Variation In TrafficVolume, Traffic Projection Factor, Origin And Destination Studies, Roadway Capacity Road Parking And Studies, Road Accidents And Studies, Accident Spot Maps, Collision Diagram, Traffic Regulation, The Stop Rule, Condition Diagram, Accident Costs, Turns, Speed Control, Traffic-Control Devices, Obstuction Approach Markings, Pedestrian, Crossings, Cyclist Crossing, Intersections, Rotaries, Three Way Interchange, Grade Separations, Diamond Interchange, Clover Leaf Interchanges, Directional Interchanges, Traffic Signals, By-Pass, Ribbon Development, Street And Highway Lighting.

5. HIGHWAY PROJECT AND ESTIMATES :

Rough Cost Estimate, Detailed Estimate, Project Report

COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

Second Year

Fourth Semester

SPECIALIZATION – I

Specialization 1	**HIGH WAY & TRANSPORTATION ENGINEERING**
Paper Code	**Subject**
MSHW 01	Highway Engineering Economics
MSHW 02	Highway Engineering & Design
MSHW 03	Highway Maintenance and Management System
MS 04	Project

SPECIALIZATION 1 : HIGH WAY & TRANSPORTATION ENGINEERING

MSHW 01 : HIGHWAY ENGINEERING ECONOMICS

1. Economic Parameters In The Preparation Of The Development /Construction Of Different Types Of Intersection and Interchanges.
2. Estimation and Costing Of Earthwork, Excavation, Foundation, Embankments, Compaction
3. Economics Of Different Engineering and Highway Related Surveys.
4. Costing, Estimation, Comparative Analysis Of Different Types Of Parameters.
5. Economic Costing, Estimation Of Drainage & Drainage Structure.
6. Estimation Of Different Items Along With Machinery, Human Resources, Natural Resources.
7. Economics Of Different Overlays On Different Types Of Surfaces.
8. Quantity Estimation, Costing Underground, At Surface, Elevated Transport Facilities.
9. Annual Highway Cost, Maintenance Operations and Construction Cost.
10. Economic Studies Connected With Highways Related To Proposed Highway Improvements, Priority Schedule Of Improvement, Selection Of Design Features.
11. Economics Of Different Types Of Structures – Bridges Or Tunnels, Open Cut For Tunnel, Truss Or Girder, Bridge, Earth Fill Or Bridge.

MSHW 02: HIGHWAY ENGINEERING & DESIGN

1. Highway Planning
2. Highway Development

3. Highway Alignment (Horizontal)
4. Highway Alignment (Vertical)
5. Preparation Of Highway Alignment; Working Drawing In Terms Of Coordinates, Chainages, Offsets.
6. Different Types Of Pavements & Their Suitability.
7. Highway Design Module – Alignment, Architectural Consideration, Typical Cross Section, Exit & Entry Terminals and Loop Ramp Design. Speed Change Lane Criteria- Acceleration, Length, Merging Length, Wedge Treatment, Transition Curve, Typical Entrance Terminal.
8. Engineering Surveys and Other Surveys Required For Highway Widening.
9. Hill Roads Design.
10. High Economics & Financing.

MSHW 03 : HIGHWAY MAINTENANCE AND MANAGEMENT SYSTEM

1. Maintenance Of Road Surface, Shoulders, Roadway Drainage, Bridge and Other Structure, Roadside, Amenity, Equipment.
2. High Profile Maintenance
3. Carriageway Maintenance.
4. Footways /Shoulders
5. Street Lightening and Illuminated Traffic Signs
6. Aid To Movement.
7. Road Assessment & Management System
8. Accident Precaution
9. Winter Maintenance.
10. Maintenance Of Highway Structure.
11. Maintenance and Management System Include Development Of Annual Work Programme Budgeting and Allocation Recovery, Work Authorization and Control, Scheduling, Performance Evaluation, Fiscal Control
12. Maintenance Of Approaches.
13. Vegetation Management and Control, Maintenance Of Rest Area.
14. Maintenance and Traffic Control & Safety Devices
15. Pavement Rehabilitation
16. Milling Of Pavement.
17. Pavement Recycling

MS 04 : PROJECT

Project Guidelines :

Thinking up a Project

You are expected to come up with your own idea for a project. A wide range of topics is acceptable so long as there is substantial computing content and project is predominantly of a practical, problem-solving nature. You might take up an interest which you already have in your stream of engineering. You may do your project in any reputed organization or a department. Every student is to take up a project individually. The project is a vehicle for you to demonstrate the required level of competence in your chosen field of Masters.

Start thinking about your project right in the beginning. If you want to do the project in industrial environment start your correspondence fairly early to find an organization, which is ready to accept you You must submit an

outline of your project (two or three pages) to your guide within one month of start of the project work. This must include the Title, Objective, Methodology (main steps to carry out a project), expected output and organization where you intend to carry out the project.

a Guide

When you have an idea of your project, even a tentative one, approach a suitable person who has interest and expertise in that area. The Guide may be a person with M.E. / M.Tech with a five-year working experience or a B.E./ B.Tech having a working experience of fifteen years in relevant field.

the Guide

The Guide's role is to provide support and encouragement to direct the student's attention to relevant literature, to provide technical assistance occasionally, to read and comment on the draft report and to give guidance on the standard and amount of work required. The Guide is not responsible to teach any new skills and language required for project work or for arranging any literature or equipment. You are expected to meet at least once a month to your Guide. Rest you can workout your own arrangement. The students, who are content to carry out their work largely without supervision, should keep their Guide in touch with what they are doing. A student should not remain silent for months and then appear with a complete project work unknown to supervisor. In such circumstances, the Guide cannot be counted on to give an automatic seal of his approval. If a project produces a piece of software, the Guide would normally expect to see a demonstration of the software in action.

The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addresses and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

Resist temptation to include pages of padding. If the project consists of developing an application in area with which a computer scientist would not be familiar – such as chemical testing, stock & shares – it might be necessary to include some explanatory company/ organization profile for whom you have done the work must not appear in chapters and must go to appendix part.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your own is a serious examination offence. Direct quotation form the work of others (published or un published) must always be clearly identified as such by being placed in quotation marks, it is essential that reader should be able to see where the other work ends and your begins.

Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical. In such cases, it is very difficult to find out the work done during the project. An examiner cannot be kind enough to look properly on a project that is almost unreadable.

important points for carrying out a project

- The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the beginning of the project with the business that what will you get from them and what you have to arrange yourself.
- Some times a complication arises due to the fact that some aspect of your project work is considered confidential by the company. If this is so, it is your responsibility to get whatever clearance is necessary from the organization right in the beginning as essential parts like system analysis and design, flow charts etc. can not be missing from a project report.

- Make sure you allow enough time for writing report. It is strongly recommended that do some writing work as you carry out the project rather than leaving write up until the end. You must allow at least a month to finally write the report. There has to be enough time for the supervisor to read and comment on it and for student to make changes (sometimes extensive) on the basis of the comments. You may have to prepare two or three drafts before the final submission. Remember that it is mainly the project reports that get examined. An external supervisor receives a pile of project reports written by people who he does not know. If a project produced some software he even may not get time to see it running. In most cases he forms his judgment purely on the basis of the report. Please make your report as readable as possible content wise as well as presentation wise.

1. **Introduction:** This must contain background, any previous work done in the area of your project, your objective and other relevant material that may be helpful to further explain your project work.
2. **The existing system:** The study of the present system; problems in existing system.
3. **System design:** The proposed system; Any specific problem encountered at how you handled them.
4. **Implementation of the system:** Implementation issues and their justification.
5. **Conclusions:** Any shortcoming; your assessment of your work; comparison of your work with similar works; silent features of your work any feature modification. Real times applications of your project work.

References must be given at the end following any standard way of giving references.

For example:

Langdrof, 'Theory of Alternating Current Machinery" Tata McGraw Hill, July 2003.

Finally, your project work is your brainchild and nobody knows about it more than you. Be confident to explain your work at the time of viva and be honest to accept any short falls.

<u>The Project Report Details</u>

The report should be prepared with the Word Processing software. They should be printed on A4 size (Executive Bond) paper. A margin of 1.5 inches must be allowed on left hand side for binding. The pages should be numbered. The report should be typed in the 12-font size with vertical spacing of 1.5**. You must submit three copies of your Project Report in between time designated by the University positively** alongwith **a brief Bio –Data of the Supervisor.**

A report should be hard bound (light green cover with golden print on the cover). The title of the project should be clearly visible on the cover.

The cover page should be as figures below. The first page should be title page containing the title, the candidates name, Enrolment Number, Name of Study Centre and University. Second page is a certificate from the supervisor. The 3rd page is for the acknowledgement. Fourth page gives the contents of the project report. Fifth page should be an abstract of the project followed by the chapters. You must ensure that all pages are legible. Where the project has produced software for a personal computer, you should include a CD inside the back cover of the report, along with instructions in the report how to run it.

COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

Second Year

Fourth Semester

SPECIALIZATION – 2

Specialization 2	**HYDROLOGY AND WATER RESOURCES ENGINEERING**
Paper Code	**Subject**
MSHWR 01	Irrigation and Water Resources Engineering
MSHWR 02	Waste Water Engineering
MSHWR 03	Hydrology
MS 04	Project

SPECIALIZATION – 2 : HYDROLOGY AND WATER RESOURCES ENGINEERING

MSHWR 01 : Irrigation and Water resources Engineering

1. Introduction :- Methods of irrigation – Water requirements for crops – Hydrology
2. Ground water :- Well irrigation – Reservor planning – General Dams- Gravity dams – Arch & buttress dams – Earth and rock fill dams – Spill ways dam – Diversion head works.
3. Flow irrigation – irrigation channels – Silt theories – Design procedure of an irrigation channel – water logging and canal linking – canal out lets – canal regulation works – Cross drainage works .
4. River Engineering – Water power engineering – Water resources planning.

MSHWR 02 : Waste Water Engineering

1. Introduction
2. Collection and conveyance of sewage
3. Waste water flow rates
4. Hydraulic design of sewers
5. Construction of sewers
6. Sewer appurtenances
7. Sewage pumping
8. Waste water characteristics
9. Natural methods of waste water disposal
10. Unit operation of waste water treatment
11. Preliminary treatment

12. Sedimentation and chemical clarification
13. Biological treatment
14. Treatment and Disposal of sludge
15. Septic and imhoff tanks
16. Advanced waste water treatment
17. House drainage
18. Rural sanitation
19. Solid waste disposal .

MSHWR 03: Hydrology

1. Introduction
2. Hydrometeorology
3. Probability and statistics
4. Catchments
5. Precipitation
6. Stream Flow measurement
7. Evaporation & Evapotranspiration
8. Infiltration
9. Ground water
10. Runoff
11. Hydrograph analysis
12. Instantaneous unit hydrograph
13. Flood routing
14. Design flood
15. Sedimentation

MS 04 : PROJECT

Project Guidelines :

Thinking up a Project

You are expected to come up with your own idea for a project. A wide range of topics is acceptable so long as there is substantial computing content and project is predominantly of a practical, problem-solving nature. You might take up an interest which you already have in your stream of engineering. You may do your project in any reputed organization or a department. Every student is to take up a project individually. The project is a vehicle for you to demonstrate the required level of competence in your chosen field of Masters.

Start thinking about your project right in the beginning. If you want to do the project in industrial environment start your correspondence fairly early to find an organization, which is ready to accept you You must submit an outline of your project (two or three pages) to your guide within one month of start of the project work. This must include the Title, Objective, Methodology (main steps to carry out a project), expected output and organization where you intend to carry out the project.

Arranging a Guide

When you have an idea of your project, even a tentative one, approach a suitable person who has interest and expertise in that area. The Guide may be a person with M.E. / M.Tech with a five-year working experience or a B.E./ B.Tech having a working experience of fifteen years in relevant field.

the Guide

The Guide's role is to provide support and encouragement to direct the student's attention to relevant literature, to provide technical assistance occasionally, to read and comment on the draft report and to give guidance on the standard and amount of work required. The Guide is not responsible to teach any new skills and language required for project work or for arranging any literature or equipment. You are expected to meet at least once a month to your Guide. Rest you can workout your own arrangement. The students, who are content to carry out their work largely without supervision, should keep their Guide in touch with what they are doing. A student should not remain silent for months and then appear with a complete project work unknown to supervisor. In such circumstances, the Guide cannot be counted on to give an automatic seal of his approval. If a project produces a piece of software, the Guide would normally expect to see a demonstration of the software in action.

The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addresses and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

Resist temptation to include pages of padding. If the project consists of developing an application in area with which a computer scientist would not be familiar – such as chemical testing, stock & shares – it might be necessary to include some explanatory company/ organization profile for whom you have done the work must not appear in chapters and must go to appendix part.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your own is a serious examination offence. Direct quotation form the work of others (published or un published) must always be clearly identified as such by being placed in quotation marks, it is essential that reader should be able to see where the other work ends and your begins.

Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical. In such cases, it is very difficult to find out the work done during the project. An examiner cannot be kind enough to look properly on a project that is almost unreadable.

important points for carrying out a project

- The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the beginning of the project with the business that what will you get from them and what you have to arrange yourself.
- Some times a complication arises due to the fact that some aspect of your project work is considered confidential by the company. If this is so, it is your responsibility to get whatever clearance is necessary from the organization right in the beginning as essential parts like system analysis and design, flow charts etc. can not be missing from a project report.
- Make sure you allow enough time for writing report. It is strongly recommended that do some writing work as you carry out the project rather than leaving write up until the end. You must allow at least a month to finally write the report. There has to be enough time for the supervisor to read and comment on it and for student to make changes (sometimes extensive) on the basis of the comments. You may have to prepare two or three drafts before the final submission. Remember that it is mainly the project reports that get examined. An external supervisor receives a pile of project reports written by people who he does not know. If a project produced some software he even may not get time to see it running. In most

cases he forms his judgment purely on the basis of the report. Please make your report as readable as possible content wise as well as presentation wise.

6. **Introduction:** This must contain background, any previous work done in the area of your project, your objective and other relevant material that may be helpful to further explain your project work.
7. **The existing system:** The study of the present system; problems in existing system.
8. **System design:** The proposed system; Any specific problem encountered at how you handled them.
9. **Implementation of the system:** Implementation issues and their justification.
10. **Conclusions:** Any shortcoming; your assessment of your work; comparison of your work with similar works; silent features of your work any feature modification. Real times applications of your project work.

References must be given at the end following any standard way of giving references.

For example:

Langdrof, 'Theory of Alternating Current Machinery" Tata McGraw Hill, July 2003.

Finally, your project work is your brainchild and nobody knows about it more than you. Be confident to explain your work at the time of viva and be honest to accept any short falls.

The Project Report Details

The report should be prepared with the Word Processing software. They should be printed on A4 size (Executive Bond) paper. A margin of 1.5 inches must be allowed on left hand side for binding. The pages should be numbered. The report should be typed in the 12-font size with vertical spacing of 1.5**. You must submit three copies of your Project Report in between the dates given by the University positively** alongwith **a brief Bio –Data of the Supervisor.**

A report should be hard bound (light green cover with golden print on the cover). The title of the project should be clearly visible on the cover.

The cover page should be as figures below. The first page should be title page containing the title, the candidates name, Enrolment Number, Name of Study Centre and University. Second page is a certificate from the supervisor. The 3rd page is for the acknowledgement. Fourth page gives the contents of the project report. Fifth page should be an abstract of the project followed by the chapters. You must ensure that all pages are legible. Where the project has produced software for a personal computer, you should include a CD inside the back cover of the report, along with instructions in the report how to run it.

COURSE STRUCTURE & SYLLABUS OF
MASTER OF TECHNOLOGY (M.TECH)

In

Civil

Course Structure

Second Year

Fourth Semester

SPECIALIZATION – 3

Specialization 3	**STRUCTURAL ENGINEERING**
MSS01	Design of Industrial Structures & Bridges
MSS02	Design of Hydraulic Structures
MSS03	Plastic Analysis of Metallic Structures
MS04	Project

SPECIALIZATION – 3 : STTRUCTURAL ENGINEERING

MSS 01 : Design of Industrial Structures & Bridges

(a) Design and analysis of Multi-storied framed structures.
(b) Design of liquid retaining structures.
(c) Investigation and selection of site. Economic spans. Water way calculation for bridges IRC classification for bridges.

Analysis and design of bridges selected from the following.

i) Girder Bridges
ii) Balanced Cantilever Bridges
iii) Rigid framed bridges
iv) Arch Bridges
v) Suspension Bridges

MSS 02 : Design of Hydraulic Structures

Project Planning , Site investigation, choice of type of dams, cost benefits studies, Non- overflow dams; gravity, arch and buttress type , rock fill and earthern dams, their design, stress analysis, stress concentration around opening.
Different types of spill ways and energy dissipaters, their design, preparations and protection of foundations for dams, model analysis of hydraulic structure, instrumentation in dams, temperature control in concrete dams.

MSS 03 : Plastic Analysis of Metallic Structures

Moment of resistance, shape factors, criteria of plastic analysis, comparison of Elastic and Plastic analysis, moment curvature relationships for beams, Plastic hinges, Redistribution of moments, Analysis of indeterminate beams and frames for ultimate load by the statically and mechanical method, Load interaction method, Approximate method of finding ultimate load, Uniqueness theorems, limit theorems-upper and lower bound theorems, factors affecting the fully plastic moments.
Influence of axial force and shear estimation of deflections at ultimate load, load and lateral buckling, Design of connections, Minimum weight design , Shake down analysis.

MS 04 : PROJECT

Project Guidelines :

Thinking up a Project

You are expected to come up with your own idea for a project. A wide range of topics is acceptable so long as there is substantial computing content and project is predominantly of a practical, problem-solving nature. You might take up an interest which you already have in your stream of engineering. You may do your project in any reputed organization or a department. Every student is to take up a project individually. The project is a vehicle for you to demonstrate the required level of competence in your chosen field of Masters.

Start thinking about your project right in the beginning. If you want to do the project in industrial environment start your correspondence fairly early to find an organization, which is ready to accept you You must submit an outline of your project (two or three pages) to your guide within one month of start of the project work. This must include the Title, Objective, Methodology (main steps to carry out a project), expected output and organization where you intend to carry out the project.

a Guide

When you have an idea of your project, even a tentative one, approach a suitable person who has interest and expertise in that area. The Guide may be a person with M.E. / M.Tech with a five-year working experience or a B.E./ B.Tech having a working experience of fifteen years in relevant field.

with the Guide

The Guide's role is to provide support and encouragement to direct the student's attention to relevant literature, to provide technical assistance occasionally, to read and comment on the draft report and to give guidance on the standard and amount of work required. The Guide is not responsible to teach any new skills and language required for project work or for arranging any literature or equipment. You are expected to meet at least once a month to your Guide. Rest you can workout your own arrangement. The students, who are content to carry out their work largely without supervision, should keep their Guide in touch with what they are doing. A student should not remain silent for months and then appear with a complete project work unknown to supervisor. In such circumstances, the Guide cannot be counted on to give an automatic seal of his approval. If a project produces a piece of software, the Guide would normally expect to see a demonstration of the software in action.

The main purpose of the report is to explain what you did in your project. The reader should be able to see clearly what you set out to do and what you achieved. It should describe the problem addresses and explain why you tackled it in the way you did. It should include your own assessment of how successful the project was.

Resist temptation to include pages of padding. If the project consists of developing an application in area with which a computer scientist would not be familiar – such as chemical testing, stock & shares – it might be necessary to include some explanatory company/ organization profile for whom you have done the work must not appear in chapters and must go to appendix part.

The work that is presented for examiners should be your own. The presentation of another person's work, design or program as though they are your own is a serious examination offence. Direct quotation form the work of others (published or un published) must always be clearly identified as such by being placed in quotation marks, it is essential that reader should be able to see where the other work ends and your begins.

Sometimes a project containing good work is marred by a report, which is turgid, obscure and simply ungrammatical. In such cases, it is very difficult to find out the work done during the project. An examiner cannot be kind enough to look properly on a project that is almost unreadable.

important points for carrying out a project

- The organizations or companies offer you a placement for project work out of good will or to get some useful work done. Usually the companies do not provide you everything required by you. You must settle this right in the beginning of the project with the business that what will you get from them and what you have to arrange yourself.
- Some times a complication arises due to the fact that some aspect of your project work is considered confidential by the company. If this is so, it is your responsibility to get whatever clearance is necessary from the organization right in the beginning as essential parts like system analysis and design, flow charts etc. can not be missing from a project report.
- Make sure you allow enough time for writing report. It is strongly recommended that do some writing work as you carry out the project rather than leaving write up until the end. You must allow at least a month to finally write the report. There has to be enough time for the supervisor to read and comment on it and for student to make changes (sometimes extensive) on the basis of the comments. You may have to prepare two or three drafts before the final submission. Remember that it is mainly the project reports that get examined. An external supervisor receives a pile of project reports written by people who he does not know. If a project produced some software he even may not get time to see it running. In most cases he forms his judgment purely on the basis of the report. Please make your report as readable as possible content wise as well as presentation wise.

11. **Introduction:** This must contain background, any previous work done in the area of your project, your objective and other relevant material that may be helpful to further explain your project work.
12. **The existing system:** The study of the present system; problems in existing system.
13. **System design:** The proposed system; Any specific problem encountered at how you handled them.
14. **Implementation of the system:** Implementation issues and their justification.
15. **Conclusions:** Any shortcoming; your assessment of your work; comparison of your work with similar works; silent features of your work any feature modification. Real times applications of your project work.

References must be given at the end following any standard way of giving references.

For example:

Langdrof, 'Theory of Alternating Current Machinery" Tata McGraw Hill, July 2003.

Finally, your project work is your brainchild and nobody knows about it more than you. Be confident to explain your work at the time of viva and be honest to accept any short falls.

The Project Report Details

The report should be prepared with the Word Processing software. They should be printed on A4 size (Executive Bond) paper. A margin of 1.5 inches must be allowed on left hand side for binding. The pages should be numbered. The report should be typed in the 12-font size with vertical spacing of 1.5**. You must submit three copies of your Project Report in between the dates as given by the University positively** alongwith **a brief Bio –Data of the Supervisor.**

A report should be hard bound (light green cover with golden print on the cover). The title of the project should be clearly visible on the cover.

The cover page should be as figures below. The first page should be title page containing the title, the candidates name, Enrolment Number, Name of Study Centre and University. Second page is a certificate from the supervisor. The 3rd page is for the acknowledgement. Fourth page gives the contents of the project report. Fifth page should be an abstract of the project followed by the chapters. You must ensure that all pages are legible. Where the project has produced software for a personal computer, you should include a CD inside the back cover of the report, along with instructions in the report how to run it.