Semester IV

Course Title: Mathematics-IV   **Max. Marks: 100**
Course Code: CE-421   **University Examination: 60**
Duration of Exams: 3 hours   **Sessional Assessment: 40**

Objective: The course is designed to provide basic knowledge of theory of complex variables, Numerical analysis and Z-transform to engineering students.

Unit-I

Complex Analysis-I:Function of complex variable, Limit, Continuity and differentiability of functions of complex variable, Analytic function, Cauchy-Riemann equations, harmonic function, Construction of analytic functions by Milne-Thomson method, conformal mapping and bilinear transformations.

Unit-II

Complex Analysis-II: Complex integration, Line integral, Cauchy's integral formula, Derivatives of integral, Cauchy's inequality, Lowville's theorem, Taylor's and Laurent's series, Zeros and Singularities of complex functions, Residue and Cauchy's Residue theorem, Evaluation of real integrals by using Residue theorem.

Unit-III

Numerical Analysis-I:Finite-differences and operators, Finite and divided differences table, Differences of a polynomial, Factorial notation, Relation between operators, Newton's and Lagrange's interpolation formulae, Numerical differentiation and integration, Trapezoidal rule, Simpson's one-third rule, Simpson's third-eight rule.

Unit-IV

Numerical Analysis-II: Difference equations and their solutions. Solutions of algebraic and transcendental equations by iterative, Bisection, Regula-Falsi and Newton-Raphson methods, Numerical solution of ordinary differential equations by Picard's method, Euler's method, Modified Euler's method and Runga-Kutta method.

Unit-V

Z-Transform: Introduction and definition of z-transform, Some standard forms, Linearity property, Damping rule Some standard results , shifting un to the right and to the left, Multiplication by n. Two basic theorems, Inverse Z-Transform, Convolution theorem, Application to difference equations.

Course outcomes: End of this course, students will able to understand:
1.Basic of complex variable.
2.Higher concept of complex variable.
3.Basic of numerical analysis.
4.The different methods of transcendental equations.
5.Basic of z-transform.

Text Books:
   1. **Grewal B.S.,** Higher Engineering Mathematics

Reference Books:
   1. **Santi Narayan,** Theory of Functions of Complex Variables

2. **Saxena H.C.,** Difference Calculus

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

Course Title: Structural Analysis-II   **Max. Marks: 100**
Course Code: CE-422   **University Examination: 60**
Duration of Exams: 3 hours   **Sessional Assessment: 40**

Objective: The objective of this course is to acquaint the students about various methods used to solve indeterminate beams and frames.

Unit-I

Influence lines &travelling loads
Principal of influence lines and their application to determinate structures; beams, arches & bridge trusses. Criteria for maximum moment; Moment and shear under series of moving concentrated loads in beams. Absolute maximum forces in beams under moving udl.

Unit-II

Cables and suspension bridges
Static of a suspension cable, Analysis of cable & suspension bridges with and without stiffening girders, Analysis for static loads

Unit-III

Analysis of beams and arches by force method
Method of consistent deformation for analysis of indeterminate beams. Analysis of fixed beams by integration and moment area methods. Two hinged arch and fixed arch analysis for static loads. Three moment theorem and its application to analysis of continuous beams.

Unit-IV

Approximate analysis of 2D frames
Sub frame method for approximate analysis of frames for gravity load, portal and cantilever methods for analysis of frames under lateral loads.

Unit-V

Introduction of Displacement method of analysis
Analysis of indeterminate beams & frames (with and without sway) by classical Displacement methods-slope deflection method, moment distribution methods.

Course Outcomes: Students who successfully complete this course will be able to:
1. Obtain influence line diagram for statically determinate and indeterminate structure.
2. Analyze cable and arc structure.
3. Analyze fixed and continuous beam.
4. Analysis of frame design and familiarity with contemporary issues in   structural engineering.
5. Analyze frame using displacement method.

Text Books

1. **Wang C.K,** Indeterminate Structural Analysis
2. **Jindal R.L,** Indeterminate Structural Analysis

Reference Books:

1. . Hibbler ," Structural Analysis ", Pearson Education
2. T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
5. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures ". Vol.I & II Nem Chand

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from eac

Course Title: Hydraulics-II   **Max. Marks: 100**
Course Code: CE-423   **University Examination: 60**
Duration of Exams: 3 hours   **Sessional Assessment: 40**

Objective: The objective of this course is to acquaint the students with the basic knowledge of flow of fluid in pipes and channels. They are also introduced to hydraulic machines.

Unit-I

Flow through Pipes: Nature of turbulent flow in pipes, Hydraulic and energy grade lines. Equation for velocity distribution over smooth and rough pipes, Resistance coefficient and its variation, Loss of head due to sudden expansion, Contraction, Bends etc. Concept of equivalent length, branched pipes, pipes in series and parallels, Transmission of Power**.**

Unit-II

Fluid flow Past Submerged Bodies: Drag and lift, Drag on a flat plate, cylinder and sphere. Circulation and lift on circular cylinder.

Unit-III

Flow in Open Channels: Uniform flow, Critical depth, Normal depth, Specific energy, Resistance formulae, gradually varied flow equations, Classification of water surface profiles, Hydraulic Jump.

Unit-IV

Water Hammer and Surge Tanks: Sequence of events after sudden value closure, pressure diagrams, Gradual closure or opening of the valve, Instantaneous closure of valve in a rigid pipe, Instantaneous closure of valve in an Elastic pipe and Compressible fluid, Methods of Analysis, Surge Tanks. Location and types of surge tanks.

Unit-V

Hydraulic Machines: Types of Turbines, Description and principles of Impulse and Reaction turbines, Unit quantities and specific speed, Runaway speed, Turbine characteristics, Selection of Turbines, Cavitation, Draft Tube, Dimensions and types of draft tubes, Centrifugal pumps, specific speed, power requirements, Reciprocating pumps.

Course Outcomes: The students will be able to

1. Apply their knowledge of fluid mechanics in addressing problems in flow through pipes.
2. Understand about drag and lift force.
3. Apply their knowledge of fluid mechanics in addressing problems in open channels.
4. Understand about the pressure diagram and analysis of surge tank.
5. Have knowledge in hydraulic machines (pumps and turbines).

Text Books:
1.   **Subramanaya K**, Open channel Flow.
2.   **Kumar D. S ,** Fluid mechanics, S. K. Kataria & Sons publishers, New Delhi, 1998.

Reference Books:

1. **Garde R. J**, Engineering Fluid Mechanics.
2. **Ranga Raju, K.G,** Flow through Open Channels, TMH Ltd, New Delhi, 1986.
3. **Nigam P.S**, Handbook of Hydropower Engineering.
4. **Deshmukh, M.M.** Water Power Engineering, Dhanpat Rai & Sons, Delhi, 1978.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Course Title: Surveying-II   **Max. Marks: 100**
Course Code: CE-424   **University Examination: 60**
Duration of Exams: 3 hours   **Sessional Assessment: 40**

Objective: The objective of this course is to acquaint the students about tachometric and theodolite surveying and will be introduced to setting out works.

UNIT-I
Theodolite Surveying
Different terms used ,Construction, Temporary adjustment of transit Theodolite; Angle measurements(horizontal and vertical) Measurement of deflection angle and magnetic bearing, Theodolite traversing-Traverse calculations; Traverse adjustments. Height of objects.

UNIT-II
Tachometry
Tachometry, Determination of Stadia constants, Anallatic lens, Methods of Tachometry, Heights and distances from stadia intercepts; Subtense method, Tangential method; Measurement of distances, Problems.

UNIT-III
Curves
Curves, Elements of simple curve, Types of horizontal curves, Design and setting out of a simple curve, compound curve, Transition curve objectives, requirements and calculation of lengths, Vertical Curves.

UNIT-IV
Geodetic Surveying
Triangulation- principles: Choice of stations, Base line measurements and corrections applied ,Electronic methods of distance measurements, Satellite station, Triangulation adjustments; Spherical excess, Computations of sides of spherical triangles, Basenet.

UNIT-V

Introduction to Remote Sensing: Idealized remote sensing, Basic principles: EM spectrum, Wavelength regions and their applications in remote sensing, Interaction of EM radiation with atmosphere and earth's surface. Platforms and sensors. Applications of remote sensing.

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

1. Theodolite and its use.
2. About tachometric survey.
3. Understand different types of cures and their design.
4. Understand triangulation and their application.
5. Understand about basic of remote sensing.

TEXT BOOKS
1. Duggal, S.K." Surveying" Vols. I & II, Tata McGraw Hill, New Delhi,20M
2. Punmia, B.C."Surveying" Vol. 1&2, Laxmi Publications Pvt. Ltd, New Delhi, 2002

BOOKS RECOMMENDED

1. Surveying Vols. I & II by Dr. K.R.Arora
2. Basak "Surveying & Levelling" Tata McGraw Hill, New Delhi
3. Kanetkar, T.P. and Kulkarni, S.V."Surveying & Levelling" Vols. I & II PVG Prakashan, Pune, 1994.
4. Surveying & Levelling   by P.B. Shahni

Note for Paper Setter: The Question paper shall comprises of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit

Course Title: Construction Tech. & Management   Max. Marks: 100
Course Code: CE-425   University Examination: 60
Duration of Exams: 3 hours   Sessional Assessment: 40

Objective: The objective of this course is to acquaint the students about equipments employed to construct civil engineering structures and the methodology to execute various construction works.

UNIT-I

Introduction to Project Management: Introduction, project planning, scheduling, controlling, methods of planning & programming, bar chart, development of bar chart, (illustrative examples), shortcomings of bar chart, milestone chart.

UNIT-II

CPM: Network analysis; Introduction, event, activity, activity time, dummy, network rules, graphical guidelines for network, skip numbering, float, free float, independent float, Numerical problems for computation of activity times, total float, free float, independent float for each activity and also to obtain location of the critical path.

UNIT-III

PERT: Network analysis; Introduction, Time estimate(optimistic time estimate, pessimistic time estimate, most likely time estimate),Frequency distribution, plot of frequency distribution curves (illustrative examples),Slack, positive slack, negative slack, zero slack, Introduction to mean, variance and standard deviation, Numerical problems based on computation of earliest expected time, latest occurrence time, slack, critical path.

UNIT-IV

Excavation and Formwork: Earth moving, drilling, blasting, dewatering, shoring, strutting, disposal and underpinning. Well sinking and pile driving. Form Work: types, material and use, Scaffolding.

UNIT-V

Construction Equipments: Selection of equipments, Excavation equipments –Tractor, Bulldozer, Power Shovel and grader, Compaction Equipment-Sheep's foot Roller, Hauling equipments-Truck, Dump truck, Dumpers, Hydraulic cranes.

Course Outcomes: After successfully studying this course, students will have:
1. An understanding of projects and modern construction practices.
2. A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resource required and project economics.
3. A basic ability to plan, control and monitor construction projects with respect to time and cost and an idea of how to optimise construction projects based on costs
4. An idea how construction projects are administered with respect to contract structuresand issues.
5. An idea of all construction equipments.

Books Recommended:

1. Punmia B.C, PERT & CPM.
2. Purifoy R. L, Construction Methods, Plant & Equipment.
3. Arora S.P, Bindra S.P, Building Construction, Dhanpat Rai publication.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Semester IV

Course Title: Building Drawing   Max. Marks: 100
Course Code: CE-426   External Examination: 60
Duration of Exams: 4 hours   Internal Assessment: 40

Objective: The objective of this course is to enable the students to visualize and draw plans, elevations and sections of various components of buildings.

Unit-I

Standard Conventions in Drawing & Foundations: Basic principles of Building Drawing, Graphical Symbols of Elements of building (Excluding electric & sanitary elements) Simple drawing exercises on foundations: (Spread footing foundation, mat foundation, pile foundation, well foundation).

Unit-II

Plans, Elevations and Sections of buildings: Drawings of plans, Elevations and Sections giving construction details of important building components including Foundation, Plinth, DPC, Lintels, Slabs and Roofs, Full Specifications for each component.

Unit-III

Doors, Windows & Lintels: Simple drawing exercises on building Doors(Ledged & battened door, Ledged battened & braced door, Ledged battened braced & framed door, Single, double, four & six paneled door), Windows (panelled window , Panelled & glazed window, Corner window, Bay window, Casement window), Ventilators. Types of Lintels and their construction details.

Unit-IV

Stairs and Staircases: Stair, Technical Terms used in stairs, Proportioning of staircases. Drawing and construction details of Stair-case(solid spandrel filling, open spandrel, Two side stringer, Central-single stringer straight flight, cantilever steps, R.C.C. Stair case: Dog-legged stairs, open well stair, inclined slab).

Unit-V

R.C.C Drawing: Drawing and construction details of RCC slabs (One way, two way) beams (cantilever beam, Simply supported beam), columns with footings (Square, rectangular, circular).Bar bending schedule.

Course Outcomes: On completion of this course, the students will be able to
1. Implement the regulations for layout planning and preparation of drawings.
2. Draw plans and sections of building.
3. Know different types of doors and windows.
4. Draw different types of stairs of buildings.
5. Understand the detailing of RCC beam and slab.

Books Recommended:

1. **M.G. Shah, Tata McGraw Hill,** Building' Drawing.
2. **R. S. Malik,** Civil Engineering Drawing, Computech

3. **R. Chakorobarty,** Civil Engineering Drawing.
4. **J. B Mc. Kay**, Civil Engineering drawing
5. **Sharma &' Koul** Building Construction.
6. **V.B. Sikka:** civil engineering drawing

Note for Paper Setter: The question paper shall comprise of 10 questions with no Theory. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit. Time duration of paper is four hours.

Course Title: Structural Analysis-II Lab.   **Max. Marks: 50**
Course Code: CE-431   **University Examination: 25**
Duration of Exams: 2 hours   **Internal Assessment: 25**

List of Practical's:

1. To determine strain in an externally loaded beam with the help of strain gauge. (Apparatus, Strain gauge indicator, Weights, Hanger, Scale, Vernier caliper)

2. To study behavior of different types of columns and find Euler's buckling load. (Apparatus: Column buckling apparatus, Weights, Hanger, Dial gauge, Scale, Vernier calipers)

3. To study three hinged arch for horizontal displacement of the roller end for a given system of loading and to compare the same with analytic values.

4. To study two hinged arch for horizontal displacement of the roller end for a given system of loading and to compare the same with analytic values.
    (Apparatus: two hinge, Arch apparatus, Weights, Hanger, Dial gauge, Scale, Vernier calipers)

5. To study the behaviour of portal frame under different end conditions.
    (Apparatus portal frame apparatus).

6. To determine value of flexural rigidity for a given beam and compare with analytical value.
    (Apparatus Electric properties of deflected beam apparatus).

7. To determine the deflection of pin connected truss.
    (Apparatus Truss apparatus)

8. To determine material fringe value using diffused light research polar scope
    (Apparatus diffused light research polariscope-photo-elastic model)

9. To verify the moment area theorem regarding slopes and deflections of a beam.
    (Moment area theorem apparatus)

10. To determine the moment required to produce a given rotation at one end of a beam when other end is pinned.

Course Outcomes: On completion of this course, the students will be able to
1. Use different apparatus of structural lab .
2. Understand the behavior of column.
3. Understand the behavior of two and three hinged bridges.
4. Determine flexural rigidity of beam.
5. Determine deflection of beam.

Course Title: Hydraulics-II Lab.   **Max. Marks: 50**
Course Code: CE-432   **University Examination: 25**
Duration of Exams: 2 hours   **Internal Assessment: 25**

List of Practical's:

1. To determine the loss coefficient for various pipe fittings.

2. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.

3. To determine Manning's coefficient of roughness N for the bed of a given flume.

4. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.

5. To calibrate a broad crested weir.

6. To study the formation of hydraulic jump.

Course Outcomes: On completion of this course, the students will be able to
1. Determine different losses in pipe fittings.
2. Understand the velocity distribution in pipe and OCF.
3. Determine Manning's coefficient of roughness N.
4. Understand the hydraulic jump.

Course Title: Surveying-II (Lab.)   **Max. Marks: 50**

Course Code: CE – 433   **University Examination: 25**

Duration of Exams: 2 hours   **Sessional Assessment: 25**

List of Practicals:

    A. **THEODOLITE SURVEYING**
       1. Study of Equipment:
             i. Ordinary Theodolites
             ii. ED M Theodolites
          iii. G T S Theodolites.
       2. Temporary Adjustments of a Theodolite.
       3. Field work using a Theodolite:
             i. Measurement of Horizontal and Vertical Angles by ordinary and electronic theodolites.
             ii. Measurement of linear and angular measurements
                using EDM/GTS Instruments. (Basic Introduction)
          iii. Measurement of magnetic bearing.

    B.   **TACHEOMETRIC SURVEYING**
       1. Study of equipment and graduated staff.
       2. Temporary adjustments
       3. Field work:
             i. Determination of Constants" K & C "
             ii. Stadia traversing & recording stadia field book
             iii. Location of Details by Tacheometric Methods
      4. Subtense Bar Method: Theory and Field work

Course Outcomes: On completion of this course, the students will be able to
1. Understand about theodolite and its use.
2. Perform Techeometric surveying in the field.