# UNIVERSITY OF MUMBAI

## Bachelor of Engineering

**Civil Engineering (Second Year – Sem. III & IV), Revised course**

**(REV- 2012) from Academic Year 2012 -13,**

**Under**

## FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

**University of Mumbai**

**Scheme of Instructions and Examination**

**Second Year Engineering (Civil Engineering)**

**(With Effect from 2013-2014)**

**Semester III**

| Subject Code | Subject Name | Teaching Scheme (Contact Hours) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | Pract. | Tut. | Total |
| CE-C301 | Applied Mathematics-III* | 4 | -- | -- | 4 | -- | -- | 4 |
| CE-C302 | Surveying – I | 3 | 2 | -- | 3 | 1 | -- | 4 |
| CE-C303 | Strength of Materials | 4 | 2 | -- | 4 | 1 | -- | 5 |
| CE-C304 | Building Materials and Construction | 3 | 2 | -- | 3 | 1 | -- | 4 |
| CE-C305 | Engineering Geology | 3 | 2 | -- | 3 | 1 | -- | 4 |
| CE-C306 | Fluid Mechanics – I | 3 | 2 | -- | 3 | 1 | | 4 |
| CE-C307 | Database and Information Retrieval System* | -- | 4‡ | -- | -- | 2 | -- | 2 |
| **Total** | | **20** | **15** | **--** | **20** | 7 | **--** | **27** |

| Subject Code | Subject Name | Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End Sem. Exam. | Exam. Duration (in Hrs) | | | | |
| | | Test 1 | Test 2 | Avg. | | | | | | |
| CE-C301 | Applied Mathematics-III* | 20 | 20 | 20 | 80 | 3 | -- | -- | -- | 100 |
| CE-C302 | Surveying – I | 20 | 20 | 20 | 80 | 3 | 25 | -- | 25 | 150 |
| CE-C303 | Strength of Materials | 20 | 20 | 20 | 80 | 3 | 25 | -- | 25 | 150 |
| CE-C304 | Building Materials and Construction | 20 | 20 | 20 | 80 | 3 | 25 | -- | 25 | 150 |
| CE-C305 | Engineering Geology | 20 | 20 | 20 | 80 | 3 | 25 | -- | 25 | 150 |
| CE-C306 | Fluid Mechanics – I | 20 | 20 | 20 | 80 | 3 | 25 | -- | -- | 125 |
| CE-C307 | Database and Information Retrieval System* | -- | -- | -- | -- | -- | 25 | 25 | | 50 |
| **Total** | | **120** | **120** | **120** | **480** | -- | **150** | **25** | **100** | **875** |

‡ For the subject 'Database and Information Retrieval System' although 4 (Four) clock hours are mentioned under the head of Practical, 2 (Two) clock hours out of these 4 (Four) clock hours may be utilized as the Theory at the Institute/ College level to impart the theoretical aspects of the said subject; and accordingly, provision may be made in the Time Table. * Course common for Civil Mechanical, Automobile & Production Engineering.

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE-C 301 | Applied Mathematics-III | 4 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 04 | - | -- | 04 | - | -- | 04 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | -- | - | - | 100 |

**Rationale**

The study of mathematics is necessary to develop in the students the skills essential for studying new technical developments. This subject introduces some applications of engineering, through which the students can understand the link of mathematics with engineering principles. The course deals with the topics such as Laplace Transform, Complex Variables, Fourier Series and Partial Differential Equations.

**Objectives**

- To provide students with a sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze engineering problems.
- The make the students understand the basic principles of Laplace Transform, Fourier series, Complex Variables.

**Detailed Syllabus**

| Module | Sub-Modules/ Contents | | Periods |
|---|---|---|---|
| **I.** | **1. Laplace Transform** | | **5** |
| | **1.1** | Function of bounded variation, Laplace Transform of standard functions such as 1, $t^n$, $e^{at}$, $\sin at$, $\cos at$, $\sinh at$, $\cosh at$ | |

| | | | |
|---|---|---|---|
| | **1.2** | Linearity property of Laplace Transform, First Shifting property, Second Shifting property, Change of Scale property of L.T., $L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)\,du\right\}, L\left\{\frac{d^n f(t)}{dt^n}\right\}$ (without proof) Heaviside Unitstep function, Direct Delta function, Periodic functions and their Laplace Transform | |
| **II.** | **2. Inverse Laplace Transform** | | **5** |
| | **2.1** | Inverse Laplace Transform: Linearity property, use of theorems to find inverse Laplace Transform, Partial fractions method and convolution theorem (without proof). | |
| | **2.2** | Applications to solve initial and boundary value problems involving ordinary differential equations with one dependent variable. | |
| **III.** | **Complex variables** | | **10** |
| | **3.1** | Functions of complex variable, Analytic function, necessary and sufficient conditions for $f(z)$ to be analytic (without proof), Cauchy-Riemann equations inpolar coordinates. | |
| | **3.2** | Milne- Thomson method to determine analytic function $f(z)$ when it's real or imaginary or its combination is given. Harmonic function, orthogonal trajectories. | |
| | **3.3** | Mapping: Conformal mapping, linear, bilinear mapping, cross ratio, fixed points and standard transformations such as Rotation and magnification, inversion and reflection, translation. | |
| **IV.** | **4. Complex Integration** | | **10** |
| | **4.1** | Line integral of a function of a complex variable, Cauchy's theorem for analytic function, Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's integral formula and deductions. | |
| | **4.2** | Singularities and poles: | |
| | **4.3** | Taylor's and Laurent's series development (without proof) | |
| | **4.4** | Residue at isolated singularity and its evaluation. | |
| | **4.5** | Residue theorem, application to evaluate real integral of type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\,d\theta$, & $\int_{-\infty}^{\infty} f(x)\,dx$ | |
| **V.** | **5. Fourier Series** | | **10** |
| | **5.1** | Orthogonal and orthonormal functions, Expressions of a function in a series of orthogonal functions, Dirichlet's conditions, Fourier series of periodic | |

| | | | |
|---|---|---|---|
| | | function with period$2\pi$ & $2l$. | |
| | **5.2** | Dirichlet's theorem(only statement), even and odd functions, Half range sine and cosine series, Parsvel's identities (without proof) | |
| | **5.3** | Complex form of Fourier series. | |
| **VI.** | **6. Partial Differential Equations** | | **12** |
| | **6.1** | Numerical Solution of Partial differential equations using Bender Schmidt Explicit Method, Implicit method (Crank- Nicolson method) Successive over relaxation method. | |
| | **6.2** | Partial differential equations governing transverse vibrations of elastic string its solution using Fourier series. | |
| | **6.3** | Heat equation, steady-state configuration for heat flow. | |
| | **6.4** | Two and Three dimensional Laplace equations. | |

**Contribution to Outcomes**

On successful completion of this course, the students will be able to:

- Demonstrate the ability of using Laplace Transform and Fourier Series in solving the Ordinary Differential Equations and Partial Differential Equations.
- Identify the analytic function, harmonic function, orthogonal trajectories and to apply bilinear transformations and conformal mappings.
- Identify the applicability of theorems and evaluate the contour integrals.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **four** questions need to be solved.

**Term Work:**

The term work shall comprise of the assignments (minimum eight numbers) solved by the students during the tutorial class.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded depending upon the quality of the term work. The final certification and acceptance of the term work ensures the satisfactory performance during tutorials.

**Recommended Books:**


1. Elements of Applied Mathematics: *P N Wartikar and J N Wartikar*; Pune Vidyarthi Griha Prakashan.
2. Higher Engineering Mathematics: *Dr B. S. Grewal*; Khanna Publications.
3. Advanced Engineering Mathematics: *E Kreyszing*, Wiley Eastern Limited.


**Reference Books:**


1. Complex Variables: *Churchill*, Tata Mc-Graw Hill Publications
2. Numerical Methods: *Kandasamy*
3. Integral Transforms and their Engineering Applications, Dr B. B. Singh, Synergy Knowledgeware, Mumbai

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE- C 302 | Surveying -I | 4 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 03 | 02 | - | 03 | 01 | - | 04 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | 25 | - | 25 | 150 |

**Rationale**

Surveying is a core subject for civil engineers. It is the first step towards all civil engineering projects. A good surveyor is an asset to the company, organization or establishment. All the civil engineering projects such as buildings, transportation systems including roads, bridges, railways, airports along with dams and water/ sewage treatment plants start with surveying as the basic operations. Hence, the knowledge of surveying is very essential to all the civil engineering professionals. In this subject, the students get acquainted with the basic methods and equipments that are used in surveying and it helps them to produce plans and sections. It is also useful in setting out civil engineering structures on construction sites.

**Objectives**

Students will be able to:

- Apply principles of surveying and levelling for civil engineering works
- Use the appropriate methods of surveying.
- Perform various projects using different instruments skillfully.
- Take linear and angular measurements.
- Record the data in field book.
- Draw the plans and sections.
- Compute areas and volumes.

**Detailed Syllabus**

| Module | Sub-Modules/ Contents | | Periods |
|---|---|---|---|
| **1.** | **Introduction** | | **05** |
| | 1.1 | Definition, principles, object, uses and necessity of surveying.<br>Various types of surveying– based on methods and instruments, classifications-Plane surveying and geodetic surveying, Scales, Plain and diagonal scale, use of various types of verniers and micrometers in survey instruments. | |
| | 1.2 | Chain surveying, study of ranging, Instruments required for linear measurements and setting out right angles. | |
| **2.** | **Levelling** | | **10** |
| | 2.1 | Definitions, technical terms, principle of levelling, different types of levels such as dumpy, tilting, wye level, auto level and laser level, temporary and permanent adjustments of level | |
| | 2.2 | Levelling staff – Different types, classification of levelling, reduction of levels. Precise level and levelling staff, and field procedure for precise levelling.<br>Difficulties in levelling work, corrections and precautions in levelling work, problems, corrections due to curvature and refraction. | |
| **3.** | **Contouring** | | **03** |
| | 3.1 | Contouring: definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring. Grade contour: definition and use. | |
| | 3.2 | Computation of volume by trapezoidal and prismoidal formula, volume from spot levels, volume from contour plans. | |
| **4.** | **Traversing** | | **13** |
| | 4.1 | Compass survey:<br>Bearings: Definition, different types and designations, compass- prismatic and surveyor's, declination, local attraction, plotting of compass survey by different methods. | |
| | 4.2 | Theodolite traverse:<br>Various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration. | |
| | 4.3 | Different methods of running a theodolite traverse, Gales traverse table, | |

| | | | |
|---|---|---|---|
| | | balancing of traverse by Bow- Ditch's, transit and modified transit rules | |
| | 4.4 | Problems on one plane and two plane methods, omitted measurements, Precautions in using transit, errors in theodolite traversing; Use of theodolite for various works such as prolongation of a straight line, setting out an angle, bearing measurements. | |
| 5. | **Areas** | | **04** |
| | 5.1 | Area of a irregular figure by trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods. | |
| | 5.2 | Planimeter: types including digital planimeter, area of zero circle, use of planimeter. | |
| **6.** | **Plane Table Surveying** | | **04** |
| | 6.1 | Definition, uses and advantages , temporary adjustments | |
| | 6.2 | Different methods of plane table surveying | |
| | 6.3 | Errors in plane table surveying | |
| | 6.4 | Use of telescopic alidade | |

**Contribution to Outcomes**

On completion of the course, the students will be able to:

- Take linear and angular measurements
- Record the various measurements in the field book
- Find the areas of irregular figures.
- Prepare the plans and sections required for civil engineering projects.

The successful completion of the course shall equip the students to undertake the course Surveying-II.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **four** questions need to be solved.

**Oral Examination:**

The oral examination shall be based on the entire syllabus and the term work.

**List of Practicals**:

1. Chaining Ranging and offsetting.
2. Measuring Bearing of survey lines using Prismatic compass.
3. Measuring bearing of survey lines using Surveyor's compass.
4. Measurement of horizontal angle by Repetition Method.
5. Measurement of horizontal angle by Reiteration Method.
6. Measurement of vertical Angle using theodolite.
7. Determination of R.L of points using Auto level and Dumpy level.
8. Determination of areas of irregular figures by planimeter.
9. Plane table surveying by various methods.

**Term work:** It shall consist of the following:

1. Field book submission on afore-mentioned practicals conducted on and off the field.
2. Drawing sheets of a three day projects on compass / theodolite traversing and plane table surveying.
3. The assignments shall comprise of the minimum 20 problems covering the entire syllabus divided properly module wise.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded for the various components of the term work and depending upon the quality of the term work. The final certification and acceptance of term work warrants the satisfactory performance of laboratory and field work by the student, appropriate completion of the assignments.

**Recommended Books**:


1. Surveying and Levelling: Vol-I and II: *Kanetkar and Kulkarni*, Pune Vidyarthi Griha, Pune.
2. Surveying and Levelling: *N N Basak*, Tata McGraw Hill, New Delhi.
3. Surveying*: R. Agor*, Khanna Publishers.
4. Surveying: Vol-I: *Dr K.R. Arora*, Standard Book House.
5. Surveying and Levelling (2nd Edition): *R. Subramanian*; Oxford Higher Education.
6. Surveying and levelling (Vol.-I): *Dr. B.C. Punmia*, Laxmi Publications.
7. Surveying and Levelling (Vol.-I):*S. K.Duggal*, Tata Mc-Graw Hill

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE-C 303 | Strength of Materials | 4 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 04 | 02 | - | 04 | 01 | - | 05 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | 25 | - | 25 | 150 |

**Rationale**

There are different types of structures made up of different materials such as concrete, steel, metals and timber. They are subjected to various types of loading/ forces such as axial, shear, bending and torsion. This subject equips the students to analyze the internal behavior of material of the structural members under different types of loading. The knowledge gained in this subject is helpful to study other subjects like Structural Analysis and Structural Design.

**Objectives**

- To study the engineering properties of the materials and solids and analyze the same to evaluate the stress –strain behaviour.
- To analyze the internal forces for the statistically determinate and compound beams having internal hinges with different types of loading.
- To understand the concept and behaviour of flexural members (beams) in flexure and shear, solid circular shaft for tension, thin shells for internal stresses.
- To introduce the concept of strain energy for axial, flexure, shear and torsion.
- To study the behaviour of axially loaded columns using different theories available for the analysis with various end conditions.

**Detailed Syllabus**

| Module | Sub-Modules/ Contents | | Periods |
|---|---|---|---|
| **I.** | **1. Shear Force and Bending Moment in Beams** | | **07** |
| | **1.1** | Axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading. | |
| | **1.2** | Relationship between rate of loading, shear force and bending moment. | |
| **II.** | **2. Stresses and Strains** | | **07** |
| | **2.1** | Stresses, Strains, Modulus of elasticity (E), Modulus of rigidity (G), Bulk Modulus (K), Yield Stresses, Ultimate Stress, Factor of safety, shear stress, Poisson's ratio. | |
| | **2.2** | Relationship between E, G and K, bars of varying sections, deformation due to self weight, composite sections, temperature stress. | |
| **III.** | **3. Theory of Simple Bending** | | **06** |
| | Flexure formula for straight beam, moment of inertia, transfer theorem, polar moment of inertia, simple problems involving application of flexure formula, section modulus, moment of resistance, flitched beams. | | |
| | **4. Strain Energy** | | **03** |
| | Strain energy due to axial force, stresses in axial member and simple beams under impact loading. | | |
| **IV.** | **5. Shear Stresses in Beams** | | **06** |
| | Distribution of shear stress across plane sections commonly used for structural purposes, shear connectors. | | |
| | **6. Theory of Simple Torsion** | | **06** |
| | Torsion in circular shafts-solid & hallow, stresses in shaft when transmitting power, closed coil helical spring under axial load | | |
| **V.** | **7. Direct and Bending Stresses** | | **06** |
| | Application to member's subjected to eccentric loads, core of section, problems on chimneys, retaining walls etc involving lateral loads. | | |
| | **8. Struts** | | **03** |
| | Struts subjected to axial loading, concept of buckling, Euler's formula for struts with different support conditions, limitation, Euler's and Rankine's design formulae. | | |

| | | | |
|---|---|---|---|
| **VI** | **9. Principal Planes and Stresses** | | **05** |
| | **9.1** | General equation for transformation of stress, principal planes and principal stresses, maximum shear stress, stress determination using Mohr's circle, | |
| | **9.2** | Principal stresses in shafts subjected to combined torsion, bending & axial thrust, and concept of equivalent torsional and bending moment. | |
| | **10. Thin Cylindrical and Spherical Shells** | | |
| | Cylindrical and spherical shells under internal pressure. | | **03** |

**Contribution to Outcomes**

On completion of the course, the students will be able to:

- Understand and determine the engineering properties for metals and non metals.
- Understand the concepts of shear force, bending moment, axial force for statically determinate beams and compound beams having internal hinges; and subsequently, its application to draw the shear force, bending moment and axial force diagrams.
- Analyze the flexural members for its structural behaviour under the effect of flexure (bending), shear and torsion either independently or in combination thereof.
- Study the behaviour of the structural member under the action of axial load, bending and twisting moment.
- Study the deformation behaviour of axially loaded columns having different end conditions and further, evaluate the strength of such columns.

The successful completion of the course will equip the students for undertaking the courses dealing with the analysis and design of determinate and indeterminate structures.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **four** questions need to be solved.

**Oral Examination:**

The oral examination shall be based on the entire syllabus and the report of the experiments/ practicals conducted by the students including assignments.

**List of Practicals:**

1. Tension test on mild steel bars ( stress-strain behaviour ,Young's modulus determination)
2. Tests on Tor Steel ( Tension, bend and re-bend )
3. Transverse Test on cast iron.
4. Shear Test on mild steel, cast iron, and brass.
5. Torsion Test on mild steel and cast iron bar.
6. Brinell Hardness test ( any three metal specimen)
7. Rockwell Hardness test on mild steel.
8. Izod / Charpy impact test (any three metal specimen)

**Term Work:**

The term work shall comprise of the neatly written report based on the above mentioned experiments and assignments. The assignments shall comprise of the minimum 20 problems covering the entire syllabus divided properly module wise.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded for the various components of the term work and depending upon the quality of the term work. The final certification and acceptance of term work warrants the satisfactory performance of laboratory work by the student, appropriate completion of the assignments.

**Recommended Books:**


1. Strength of Materials: *S. Ramamrutham*, Dhanpatrai Publishers.
2. Strength of Materials: *R.K. Rajput*, S. Chand Publications.
3. Mechanics of Materials: Vol-I: *S.B. Junnarkar and H.J. Shah*, Charotar Publications.
4. Strength of Materials: *Subramanian*, Oxford University Press
5. Strength of Materials: *S.S. Rattan*, Tata Mc-Graw Hill, New Delhi
6. Strength of Materials (Mechanics of Materials): *R.S. Lehri and A.S. Lehri*, S.K.Kataria Publishers, New Delhi
7. Strength of Materials: *Dr. V.L.Shah*, Structures Publications, Pune

**Reference Books:**


8. Mechanics of Materials: *James, M. and Barry J.*; Cengage Learning.
9. Mechanics of Materials: *Andrew Pytel and Jaan Kiusalaas*, Cengage Learning.
10. Mechanics of Materials: *Timoshenko and Gere*, Tata McGraw Hill, New Delhi.
11. Mechanics of Materials: *James M. Gere*, Books/Cole.
12. Strength of Materials: *G.H. Ryder*, Mc-Millan.
13. Mechanics of Materials: *E.P. Popov*, Prentice Hall India (PHI) Pvt. Ltd.
14. Mechanics of Materials: *Pytel and Singer*, Mc-Graw Hill, New Delhi.
15. Strength of Materials: *William A. Nash and Nillanjan Mallick*, Mc-Graw Hill Book Co .(Schaum's Outline Series)
16. Mechanics of Materials: *Beer and Johnson*, Tata Mc-Graw Hill New Delhi.

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE-C 304 | Building Materials and Construction | 4 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 03 | 02 | - | 03 | 01 | - | 04 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | 25 | - | 25 | 150 |

**Rationale**

Materials are essential elements, constituent parts (or) substances which are used to raise a building, but materials could not be turned into structures without a method of construction. This subject provides necessary knowledge about properties and uses of different types of building materials. This subject is intended for gaining useful knowledge with respect to facts, concepts, principles and procedures related to building construction system so that student can effectively plan and execute building construction work.

**Objectives**

- To study the manufacturing process, properties, and use of different types of building materials like cement, lime, mortar, concrete, stone, brick, timber, including materials such as paints and varnishes used for treatment of the surfaces so as to achieve good knowledge about the building materials.
- To enable the students to identify various components of building (foundation, masonry, roof and floor, staircase etc.), their functions and methods of construction so as to achieve good knowledge about building construction.

| Detailed Syllabus | | | |
|---|---|---|---|
| **Module** | **Sub-Modules/ Contents** | | **Periods** |
| **I.** | **Foundations**<br>Different types of structures such as load bearing structures, framed structures and composite structures, Introduction to different types of foundations: Stepped foundations, column footing, combined footing, under-reamed pile foundations. | | **7** |
| | **Construction Materials: Classification and Properties** | | |
| | **1.1** | Classification of materials, building materials symbols and requirements of building materials and products: functional, aesthetical and economical. | |
| | **1.2** | Study of properties of materials-physical, mechanical, chemical, biological and other like durability, reliability, compatibility and economic characteristics. | |
| **II.** | **Raw Materials, Manufacturing Process and Properties of Basic Construction Materials.** | | **6** |
| | **2.1** | Rocks (Stone) - quarrying, milling and surface finishing, preservative treatments. | |
| | **2.2** | Structural clay products- bricks, roofing tiles, ceramic tiles, raw materials and manufacturing process. | |
| | **2.3** | Concrete blocks, flooring tiles, paver blocks-raw materials and manufacturing process. | |
| | **2.4** | Binder material: lime, cement: physical properties and manufacturing process, plaster of Paris- properties and uses. | |
| | **2.5** | Mortar - ingredients, preparation and uses. | |
| **III.** | **Masonry Construction and Masonry Finishes** | | **6** |
| | **3.1** | Classification and bonding of stone, brick and concrete blocks | |
| | **3.2** | Masonry finishes-pointing, plastering and painting | |
| | **3.3** | **Paints and Varnishes** | |
| | | Types, constituents and uses. | |
| **IV.** | **4.1** | **Formwork** | **6** |
| | | Materials used, design considerations, shuttering, centering and staging, scaffolding. | |
| | **4.2** | **Floor and Roofs** | |
| | | Type of floors, floor finishes and suitability.<br>Type of roofs, wooden and steel trusses and roof covering | |

| | | | |
|---|---|---|---|
| **V.** | **5.1** | **Glass** | **7** |
| | | Types and uses. Introduction to glass fibre reinforced plastic. | |
| | **5.2** | **Timber** | |
| | | Varieties, defects in timber, preservative treatments and wood composites. | |
| | **5.3** | **Metal and Alloys** | |
| | | Ferrous and non ferrous metals and alloys, aluminum, tin, zinc, nickel - types and uses and anti-corrosive treatment. | |
| **VI.** | **Building Services, Air conditioning and Ventilation, Acoustics and Sound Insulation, Damp-proofing and Water proofing.** | | **7** |
| | **6.1** | Air conditioning: systems of heating, air conditioning, ventilation, construction requirements. | |
| | **6.2** | Acoustics and sound insulation: Characteristics of sound, reflection and absorption coefficient, acoustical defects, design and material. | |
| | **6.3** | Damp-proofing and water proofing: materials and methods | |

**Contribution to Outcomes**

On completion of the course, the students will be:

- Able to identify the various building materials with symbols.
- Able to identify the properties of building materials.
- Made acquainted with the manufacturing process of basic construction materials.
- Made acquainted with the masonry construction and finishes
- Aware of building services, acoustics, DPC, etc.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **four** questions need to be solved.

**Oral Examination:**

The oral examination shall be based on the entire syllabus and term work comprising of the report of the experiments/ practicals conducted by the students and a detail report of the industrial/ site visit.

**List of Experiments/ Practicals:** (Minimum **seven** to be performed)

1. Water absorption and compressive strength test of bricks.
2. Water absorption and transverse load test on tiles.
3. Moisture content and flexural strength test on timber.
4. Compression test on timber (Parallel/ perpendicular to the grains).
5. Physical properties of cement: Fineness, consistency, setting time, Soundness, Compressive strength.
6. Compression test on Paver blocks.
7. Water absorption, density and compression test on masonry blocks.
8. Abrasion test on tiles.

**Site Visit/ Industrial Visit:**

The students shall visit the brick, paver blocks, concrete block, cement, glass and plastic manufacturing industrial plants. They shall study various aspects of the plant along with various operations. The visit to any site where construction is going on may be arranged and the students may be made aware of the various construction activities. They shall prepare a report of the visit which shall include all above points. The same shall be evaluated by the concerned teacher.

**Term Work:**

The term work shall consist of:

- Report of minimum **07** experiments.
- Assignments, including at least **20** sketches on A2 size drawing sheets covering entire syllabus.
- Industrial visit report to at least **any one** of the above mentioned industrial plants.

Although minimum numbers of experiments and industrial visits are prescribed, the students shall be encouraged to perform more number of experiments and site/ industrial visits.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded for the various components of the term work and depending upon the quality of the term work including industrial/ site visit report. The final certification and acceptance of term work warrants the satisfactory performance of laboratory work by the student, appropriate completion of the assignments.

**Recommended Books:**


1. Building Construction: *S. P. Bindra and S. P. Arora*, Dhanpat Rai and Sons, Delhi.
2. Building Drawing: *M. G. Shah, C. M. Kale and S. Y. Palki*, Tata Mc-Graw Hill, Delhi.
3. Services in Building Complex: *V. K. Jain*, Khanna Publishers.
4. Materials of Construction: *D. N. Ghose*, Tata McGraw Hill, Delhi.
5. Architectural Materials science*: D. Anapetor*, Mir Publishers.
6. Introduction to Engineering Materials: *B. K. Agrawal*, Tata McGraw Hill New Delhi.
7. Engineering Materials: S.*R. Rangwala*, Charotar Publications.
8. Engineering Materials: *P. Surendra Singh*, Vani Education Books New Delhi.
9. Building Construction: *Rangwala*, Charotar Publications, Anand (Gujrat).
10. Building Materials (Products, Properties and Systems): *M.L.Gambhir and Neha Jamwal*, Mc-Graw Hill Publications.
11. Specifications for different materials, BIS Publications, New Delhi

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE-C 305 | Engineering Geology | 4 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 03 | 02 | - | 03 | 01 | - | 04 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | 25 | - | 25 | 150 |

**Rationale**

The study of Geology helps to understand about geological formations, classifications and morphology of rocks, physical properties of minerals and the importance of the study of Geology for civil engineers with regard to founding the structures like dams, bridges, buildings etc. It also gives the ideas about geological formations in causing earthquake and landslides.

**Objectives**

- Study of importance of geological studies in various civil engineering projects and Interior of the earth.
- Study of physical geology including geological action of river, wind, glacier, volcano earthquake and weathering.
- Study of minerals and rocks with classification, structure, texture and origin.
- Study of structural geology including geological structure like fold, fault, joint, etc.
- Study of geological history of peninsular India with economic minerals and building stones of India.
- Study of methods of surface and subsurface investigation and their importance.
- Study of types, lithology structural conditions, advantages, difficulties, significance of geological structures during the construction of dam and tunnel.

- Study of ground water zones, factors controlling water bearing capacity of rocks, geological work of ground water and springs
- Study of types, causes, preventive measures for landslides.
- Study of building stones with geological and engineering properties.

**Detailed Syllabus**

| Module | Sub-Modules/Contents | | Periods |
|---|---|---|---|
| I | **1. Introduction** | | **01** |
| | **1.1** | Branches of geology useful to civil engineering, Importance of geological studies in various civil engineering Projects. | |
| | **1.2** | Internal structure of the Earth and use of seismic waves in understanding the interior of the earth | |
| | **2. General and Physical Geology** | | **08** |
| | **2.1** | Agents modifying the earth's surface, study of weathering and its significance in engineering properties of rocks like strength, water tightness and durability etc. | |
| | **2.2** | Brief study of geological action of river, wind, glacier, ground water and the related land forms created by them. | |
| | **2.3** | Volcano- Central type and fissure type, products of volcano, volcanic land forms. | |
| | **2.4** | Earthquake - Earthquake waves, construction and working of seismograph, Earthquake zones of India, elastic rebound theory Preventive measures for structures constructed in Earthquake prone areas. | |
| II | **3. Mineralogy** | | **01** |
| | Identification of minerals with the help of physical properties, rock forming minerals, megascopic identification of primary and secondary minerals, study of common ore minerals | | |
| | **4.Petrology**<br>Study of igneous, sedimentary and metamorphic rocks, distinguishing properties among these three rocks to identify them in fields. | | **06** |
| | **4.1** | Igneous Petrology - Mode of formation, Texture and structure, Classifications, study of common occurring igneous rocks. | |

| | | | |
|---|---|---|---|
| | **4.2** | Sedimentary Petrology - Mode of formation , Textures, characteristics of shallow water deposits like lamination, bedding, current bedding etc., residual deposits, chemically formed and organically deposits, classification and study of commonly occurring sedimentary rocks. | |
| | **4.3** | Metamorphic Petrology - Mode of formation, agents and types of metamorphism, metamorphic minerals, rock cleavage, structures and textures of metamorphic rocks, classification and study of commonly occurring metamorphic rocks. | |
| **III** | **5. Structural Geology** | | **03** |
| | Structural elements of rocks, dip, strike, outcrop patterns unconformities, outliers and inlier, study of joints. Faults and folds, importance of structural elements in engineering operations. | | |
| | **6. Stratigraphy and Indian Geology** | | **02** |
| | General principles of Stratiagraphy, geological time scale, Physiographic divisions of India and their characteristics. Stratiagraphy of Maharashtra | | |
| **IV** | **7. Geological Investigation** | | **04** |
| | **7.1** | Preliminary Geological Investigation and their importance to achieve safety and economy of the projects supporting dams and tunnel projects ,methods of surface and subsurface investigations, excavations-Trial pit, trenches etc. | |
| | **7.2** | Core Drilling - Geological logging, Inclined Drill holes. Electrical Resistivity method, Seismic method and their applications. | |
| | **7.3** | Use of Aerial photographs, Satellite imageries in civil engineering projects. | |
| | **8. Geology of dam and reservoir site:** | | **04** |
| | **8.1** | Strengths, stability, water tightness over the foundation rocks and its physical characters against geological structures at dam sites, favorable and unfavorable conditions for locating dam sites. | |
| | **8.2** | Precautions over the unfavorable geological structures like faults , dykes , joints, unfavorable dips on dam sites and giving treatments, structural and erosional valleys. | |
| **V** | **9. Tunneling** | | **03** |
| | Importance of geological considerations while choosing tunnel sites and alignments of the tunnel, safe and unsafe geological and structural conditions, Difficulties during tunneling and methods to overcome the difficulties. | | |
| | **10. Ground water** | | **03** |

| | | | |
|---|---|---|---|
| | **10.1** | Sources, zones, water table, unconfined and Perched water tables. Factors controlling water bearing capacity of rocks, Pervious and Impervious rocks, Cone of depression and its use in Civil engineering. Geological work of groundwater, Artesian well. | |
| | **10.2** | Springs seepage sites and geological structures. Different types of rocks as source of ground water | |
| **VI** | **11. Recharge of ground water** | | **03** |
| | Methods of artificial recharge of ground water, geology of percolation tank. | | |
| | **12. Land slides** | | |
| | Types, causes and preventive measures for landslides, Landslides in Deccan region. | | |
| | **13. Building stones** | | **01** |
| | Requirements of good building stones and its geological factors, controlling properties, consideration of common rocks as building stones, study of different building stones from various formations of Indian Peninsula, | | |

**Contribution to Outcomes**

On completion of the course, the students shall be able to:

- Understand the interior structure of the earth and seismological evidences.
- Identify various landforms which are created by geological agents like wind, river, glaciers, volcanoes and earthquake.
- Recognize various types of minerals with physical properties, rocks with their textures, structures and origin. Also use of common building stones.
- Understand geological structure like folds, faults, joints, unconformity etc. knowledge of which is very essential in the design and construction of dams, tunnels etc.
- Understand surface and subsurface strata, the sources and zones of ground water.
- Apply the preventive measures for landslide and earthquake prone areas.
- Take a self decision to make his report over the site with the Geological ingredients and information, up to the need of project aim.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.

3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **fou**r questions need to be attempted.

**Oral Examination:**

Oral examination will be based on the entire syllabus and a neatly written report for the practicals along with a report of the site visit.

**List of Practicals:**

1. Study of physical properties of the minerals.
2. Identification of minerals- Quartz and its varieties, Orthoclase, Plagioclase, Muscovite, Biotite, Hornblende, Asbestos, Augite, Olivin, Tourmaline, Garnet, Actinolite, Calcite, Dolomite, Gypsum, Beryl, Bauxite, Graphite, Galena, Pyrite. Hematite, Magnetite, Chromite, Corundum, Talc, Fluorite, Kyanite.
3. Identification of rocks: *Igneous rocks*- Granite and its varieties, Syenite, Diorite, Gabbro, Pegmatite. Porphyry, Dolerite, Rhyolite, Pumice, Trachyte, Basalt and its varieties, Volcanic Breccia, Volcanic tuffs. *Sedimentwy Rocks*- Conglomerate, Breccia, Sandstone and its varieties, Shales,Limestones, Laterites. *Metamorphic Rocks*- Mica Schists, Hornblende Schists, Slate, Phyllite, Granite Gneiss , Augen gneiss, Marbles and Quartzite.
4. Study of Geological maps (At least 5).
5. Study of core samples, RQD, Core logging.
6. At least two engineering problems based on field data collected during site investigation.

**Term Work:**

The term work shall consist of the:

- Report of the practical conducted in terms of the study of the physical properties of the minerals, identification of minerals and rocks.
- Report of the Geological maps
- Report of the two problems based on field data.
- At least *eight* assignments covering entire syllabus

**Site Visit:**

There shall be a visit to get the geological information according to the various contents mentioned in the syllabus. The students shall prepare a detail report thereof along with the summarized findings. The report will form a part of the term work.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded for the various components of the term work and depending upon the quality of the term work. The final certification and acceptance of term work ensures the satisfactory performance of laboratory work.

**Recommended Books:**


1. Text book of Engineering Geology: *Dr. R. B. Gupte*, Pune Vidyarthi Griha Prakashan, Pune.
2. Text book of Engineering Geology: *P. K. Mukerjee*, Asia.
3. Text book of Engineering and General Geology: *Parbin Singh*, Carson Publication.
4. Text book of Engineering Geology: *N. Chenna, Kesavulu*, Mc-Millan.
5. Principles of Engineering Geology: *K. M. Banger*.


**Reference Books:**


1. Principles of Physical Geology: Arthur Homes, Thomas Nelson Publications, London.
2. Principles of Geomorphology: *William D. Thornbury*, John Wiley Publications, New York.
3. Geology for Civil Engineering: A. *C. McLean, C.D. Gribble, George Allen & Unwin* London.
4. Engineering Geology: A Prrthsarathy, V. Panchapakesan, R Nagarajan, Wiley India 2013.

## Semester III

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE-C 306 | Fluid Mechanics-I | 4 |

### Teaching Scheme

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| 03 | 02 | - | 03 | 01 | - | 04 |

### Evaluation Scheme

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| 20 | 20 | 20 | 80 | 03 Hrs. | 25 | - | - | 125 |

### Rationale

The concept of fluid mechanics in civil engineering is essential to understand the processes and science of fluids. The course deals with the basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics with their applications in fluid flow problems.

### Objectives

Students are introduced to:

- Properties of fluid and basic concepts applicable to fluid mechanics.
- Pascal's law, hydrostatic law and determination of Hydrostatic pressure and centre of pressure.
- Principle of buoyancy and its application
- Liquids in relative equilibrium.
- The concept of ideal fluid and fluid mechanics.
- Various flow measuring devices and their applications in the field.

### Detailed Syllabus

| Module | Sub-Modules/Contents | Periods |
|---|---|---|
| **I.** | **1. Properties of fluids** | **03** |
| | Mass density, weight density, specific gravity, specific volume, viscosity, | |

| | | | |
|---|---|---|---|
| | compressibility and elasticity, surface tension, capillarity, vapour pressure, types of fluids, basic concepts applicable to fluid mechanics. | | |
| | **2. Fluid Statics** | | **09** |
| | **2.1** | Pascal's law, hydrostatic law, pressure variation in fluids at rest. Absolute, atmospheric, gauge pressure, measurement of pressures. | |
| | **2.2** | Hydrostatic force on surface, total pressure and centre of pressure, total pressure on horizontal plane surface, vertical plane surface, Inclined plane surface, centre of pressure for vertical plane surface and for inclined plane surface, practical applications of total pressure and centre of pressure on dams, gates, and tanks. | |
| | **2.3** | Buoyancy and flotation, Archimedes principle, Metacentre, metacentric height, Stability of floating and submerged bodies, determination of metacentric height, metacentric height for floating bodies containing liquid, Time period of Transverse oscillations of floating bodies. | |
| **II** | **3. Liquids in Relative equilibrium** | | **03** |
| | Fluid mass subjected to uniform linear acceleration, liquid containers subjected to constant horizontal acceleration and vertical acceleration, fluid containers subjected to constant rotation with axis vertical and horizontal. | | |
| | **4. Fluid Kinematics** | | **05** |
| | Types of fluid flow, description of flow pattern, Lagrangian methods, Eulerian method, continuity equation, velocity and acceleration of fluid particles, velocity potential and stream function, streamline, streak line, path line, equipotential lines and flow net, uses of flow net, rotational and irrotational motions, circulation and vorticity. | | |
| **III.** | **5. Fluid dynamics** | | **08** |
| | Control volume and control surface, Forces acting on fluid in motion, Navier-Stokes Equation, Euler's Equation of motion , Integration of Euler's equations of motion, Bernoulli's Theorem and its derivation , Bernoulli's equation for compressible fluid and real fluid, applications of Bernoulli's Equation - Venturimeter, Orifice meter, nozzle meter, pitot tube | | |
| **IV.** | **Orifices and Mouthpieces** | | **05** |
| | **6.1** | Classification of orifices, flow through orifices, determination of hydraulic coefficients, flow through large rectangular orifice, flow through fully submerged and partially submerged orifice, time of emptying a tank through an orifice at its bottom | |

| | | | |
|---|---|---|---|
| | **6.2** | Classification of Mouthpieces, Flow through external cylindrical mouthpiece, convergent-divergent mouthpiece, Borda's mouthpieces. | |
| **V.** | **7. Notches and Weirs** | | **04** |
| | Classification of notches and weirs, discharge over a rectangular, triangular, trapezoidal notch/weir, velocity of approach, stepped notch, Cipolleti weir, broad crested weir, ogee weir, discharge over a submerged weir, ventilation of weirs. | | |
| **VI.** | **8. Introduction to Ideal fluid flow** | | **02** |
| | 8.1 | Uniform flow, source and Sink, free vortex flow, superimposed flow, doublet, | |
| | 8.2 | Flow past a half body, flow past a Rankine oval body and flow past a cylinder. | |

**Contribution to Outcomes**

On completion of this course the student will be able to:

- Understand basic properties of fluids and basic definitions.
- Study of pressure measuring devices.
- Study of pressure on the surface in the contact of fluids and its applications.
- Understand the concepts of buoyancy and flotation and its applications.
- Understand the fundamentals of kinematics.
- Apply Bernoulli's principle to fluid flow problems.
- Measure velocity and rate of flow using various devices.
- Concept of ideal fluid flow.

**Theory examination:**

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** and will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining five questions will be based on all the modules of the entire syllabus. For this, the modules shall be divided proportionately and further, the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. The students will have to attempt **any three** questions out of remaining five questions.
5. Total **four** questions need to be attempted.

**List of Experiments (Any six):**

1. Determination of metacentric height.

2. Verification of Bernoulli's theorem.
3. Determination of coefficient of discharge through Venturimeter.
4. Determination of coefficient of discharge through Orificemeter.
5. Determination of coefficient of discharge through Nozzlemeter.
6. Determination of coefficient of discharge through Notches (Rectangular and Triangular notch).
7. Determination of coefficient of discharge over weirs (Broad Crested weir and Ogee weir).
8. Determination of hydraulic coefficients of orifice.
9. Determination of coefficient of discharge through mouthpiece.

**Term Work:**

The term work shall comprise of the neatly written report based on the afore-mentioned experiments and assignments. The assignments shall comprise of the minimum 15 problems covering the entire syllabus divided properly module wise.

**Distribution of the Term Work Marks:**

The marks of the term work shall be judiciously awarded for the various components of the term work and depending upon the quality of the term work. The final certification and acceptance of term work warrants the satisfactory performance of laboratory work by the student, appropriate completion of the assignments.

**Recommended Books:**


1. Hydraulics and Fluid mechanics: *Dr P.M. Modi and Dr. S.M. Seth,* Standard Book House, Delhi
2. Theory and Application of Fluid Mechanics: *K. Subramanya,* Tata McGraw hill publishing company, New Delhi.
3. Fluid Mechanics: *Dr. A.K Jain,* Khanna Publishers.
4. Fluid Mechanics and Hydraulics: *Dr. S.K. Ukarande,* Ane's Books Pvt. Ltd. (Revised Edition 2012), ISBN 97893 8116 2538
5. Fluid Mechanics and fluid pressure engineering: *Dr. D.S. Kumar, F.K. Kataria* and *sons*
6. Fluid Mechanics: *R.K. Bansal* Laxmi Publications (P) Ltd.


**Reference Books:**


1. Fluid Mechanics: *Frank M. White,* Tata Mc-Graw Hill International Edition.
2. Fluid Mechanics: *Streeter White Bedford,* Tata Mc-Graw International Edition.

3. Fluid Mechanics with Engineering Applications: *R.L. Daugherty, J.B. Franzini, E.J. Finnemore*, Tata Mc-Graw Hill, New Delhi.
4. Hydraulics: *James F. Cruise, Vijay P.Singh and Mohsen M. Sherif,* CENGAGE Learning India (Pvt.) Ltd.
5. Introduction to Fluid Mechanics: *Edward J. Shaughnessy,Jr, Ira M. Katz, James P. Schaffer*. Oxford Higher Education.

**Semester III**

| Subject Code | Subject Name | Credits |
|---|---|---|
| CE- C 307 | Database and Information Retrieval System | 2 |

**Teaching Scheme**

| Contact Hours | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|
| Theory | Practical | Tutorial | Theory | Practical | Tutorials | Total |
| - | 04* | - | - | 02 | - | 02 |

**Evaluation Scheme**

| Theory | | | | | Term Work/ Practical/Oral | | | Total |
|---|---|---|---|---|---|---|---|---|
| Internal Assessment | | | End Sem Exam | Duration of End Sem Exam | TW | PR | OR | |
| Test 1 | Test 2 | Average | | | | | | |
| - | - | - | - | - | 25 | 25# | | |

**Rationale**

The students of Civil Engineering are often required to deal with the huge amount of data. The students are expected to be aware of the management of the data and its retrieval whenever need arises. This course concerns with the management of information and how to model it in the structured manner. The use of database management, as an application tool to manipulate the information which has been modelled earlier, will provide the students a further step in order to apply an application of information technology in solving the problems of diverse spectrums of the field of Civil Engineering.

**Objectives**

The course aims at:

- Learning and practicing the data modeling using the entity-relationship and developing database designs.
- Understanding the use of Structured Query Language (SQL) and learn SQL syntax.
- Applying Graphical User Interface techniques for retrieve the information from database
- Understanding the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

| Detailed Syllabus |
|---|

| Module | Sub- Modules/ Contents |
|---|---|
| I. | **Introduction Database Concepts** |
| | What is a database? , Characteristics of databases, Example of database, File system V/s Database system, What is DBMS?, Users of Database system, Advantage of using an enterprise database, Concerns when using an enterprise database, Data Independence, DBMS system architecture, Database Administrator, |
| II. | **Entity–Relationship Data Model** |
| | Introduction, Benefits of Data Modeling, Types of Models, Phases of Database Modeling, The Entity-Relationship (ER) Model, Generalization, Specialization and Aggregation, Extended Entity-Relationship (EER) Model. |
| III. | **Relational Model and Algebra** |
| | Introduction , Mapping the ER and EER Model to the Relational Model , Data Manipulation , Data Integrity ,Advantages of the Relational Model, Relational Algebra , Relational Algebra Queries, Relational Calculus. |
| IV. | **Structured Query Language (SQL)** |
| | Overview of SQL, Data Definition Commands, Set operations, aggregate function, null values, Data Manipulation commands, Data Control commands, Views-Using Virtual Tables in SQL, Nested and complex queries. |
| V. | **Introduction to Transactions Management and Concurrency** |
| | Transaction concept, Transaction states, ACID properties, Implementation of atomicity and durability, Concurrent Executions, Serializability, Recoverability, Concurrency Control: Lock-based , Timestamp-based , Validation-based protocols, Deadlock handling, Recovery System: Failure Classification, Storage structure, Recovery and atomicity, Log based recovery, Shadow paging. |
| VI. | **Graphical User Interface** |
| | Murphy ’s Law of G U I Design, Features of G U I, Icons and graphics, Identifying visual cues, clear communication, color selection, GUI standard, planning GUI Design Work.<br>**Visual programming :**<br>***Sharing Data and Code*:** Working with Projects, Introduction to Basic language, Using inbuilt controls and ActiveX controls, creating and using classes, Introduction to Collections, Using and creating ActiveX Components, dynamic data exchange, object linking and embedding. |

| | |
|---|---|
| | ***Creating visual software entities:*** Working with text, graphics, working with files, file management, serial communication, and multimedia control interfaces. |

*Out of 4 (Four) clock hours designated for this course under the head of Practicals, 2 (Two) clock hours out of these 4 (Four), may be utilized as the Theory and accordingly, the provision may be made in the time-table of the respective Colleges/ Institutes.

# Indicates the Practical Examination in conjunction with the Oral.

**Contribution to Outcomes**

On successful completion of the course, the students will be able to:

- Describe data models and schemas in DBMS
- Understand the features of database management systems and relational database.
- Use SQL- the standard language of relational databases.
- Understand the functional dependencies and design of the database.
- Understand the graphical user Interface design.

**Term Work:**

The each student shall be assigned minimum two *case studies* to perform on the following experiments:

(1) Problem Definition and draw ER /EER diagram
(2) Design Relational Model
(3) Perform DDL operation
(4) Perform DML and DCL operations
(5) Design Forms using Visual programming
(6) Retrieve the information through GUI.

**Guidelines for Conducting Practical Examination:**

(1) Practical examination duration shall be of 2 (Two) hours and questions shall be based on the list of afore-mentioned experiments mentioned under the head of Term Work.
(2) Evaluation of practical examination shall be done by external examiner based on the printout of students' work
(3) Practical examination: 40 marks, oral examination based on practical examination: 10 marks
(4) Students' work along with evaluation report to be preserved till the next examination

**Recommended Books:**

1. Database System Concepts: *Korth, Slberchatz, Sudarshan*, 6th Edition, McGraw – Hill.

2. Database Management Systems: *G. K. Gupta*, McGraw – Hill.
3. GUI Design for dummies: IDG books.
4. Visual Basic 2005, How to program (3RD Edition): *Deitel & Deitel*, Pearson Education.
5. SQL and PL/SQL for Oracle 10g: *Dr. P.S. Deshpande*, Dreamtech Press.
6. Introduction to Database Management: *Mark L. Gillenson, Paulraj Ponniah*, Weley
7. Oracle for Professional: *Sharaman Shah*, SPD.
8. Database Management Systems: *Raghu Ramkrishnan and Johannes Gehrke*, TMH