# Bharati Vidyapeeth University, Pune

# Faculty of Engineering & Technology

# Programme: B. Tech. (Civil) – Sem III - 2014 Course

| Sr. No. | Subject | Teaching Scheme (Hrs/Week) | | | Examination Scheme (Marks) | | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P/D | T | End Sem. Exam | Unit Test | Attendance | Assignments | TW & Oral | TW & Practical | Total | Theory | TW | Total |
| 1. | Building Planning, Design and Byelaws* | 3 | 2 | -- | 60 | 20 | 10 | 10 | 50 | -- | 150 | 3 | 1 | 4 |
| 2. | Applied Geology | 3 | 2 | -- | 60 | 20 | 10 | 10 | -- | 50 | 150 | 3 | 1 | 4 |
| 3. | Engineering Economics & Financial Accounting | 3 | - | - | 60 | 20 | 10 | 10 | -- | --- | 100 | 3 | -- | 3 |
| 4. | Mechanics of Solids | 4 | -- | 1 | 60 | 20 | 10 | 10 | --- | --- | 100 | 5 | - | 5 |
| 5. | Concrete Technology | 3 | -- | -- | 60 | 20 | 10 | 10 | -- | ---- | 100 | 3 | - | 3 |
| 6. | Professional Skill Development-III | 4 | -- | -- | 100 | --- | ---- | -- | -- | ---- | 100 | 4 | - | 4 |
| 7. | Computer Applications in Civil Engineering-II | --- | 2 | -- | --- | -- | --- | --- | --- | 50 | 50 | --- | 1 | 1 |
| 8. | Testing of Materials | -- | 2 | -- | -- | -- | -- | -- | 50 | --- | 50 | -- | 1 | 1 |
| | **Total** | **20** | **08** | **01** | **400** | **100** | **50** | **50** | **100** | **100** | **800** | **21** | **4** | **25** |

*End Semester Exam of duration 4 hours.

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## Programme: B. Tech. (Civil) – Sem IV - 2014 Course

| Sr. No. | Subject | Teaching Scheme (Hrs/Week) | | | Examination Scheme (Marks) | | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P/D | T | End Sem. Exam | Unit Test | Atten dance | Assig nment s | TW & Oral | TW & Practic al | Total | Theor y | TW | Total |
| 9. | Engineering Mathematics-III | 3 | -- | 1 | 60 | 20 | 10 | 10 | -- | --- | 100 | 4 | - | 4 |
| 10. | Surveying | 3 | 4 | -- | 60 | 20 | 10 | 10 | -- | 50 | 150 | 3 | 2 | 5 |
| 11. | Mechanics of Fluids | 3 | 2 | -- | 60 | 20 | 10 | 10 | 50 | ---- | 150 | 3 | 1 | 4 |
| 12. | Construction Techniques and Machinery | 3 | -- | -- | 60 | 20 | 10 | 10 | --- | ---- | 100 | 3 | - | 3 |
| 13. | Structural Analysis- I | 3 | -- | -- | 60 | 20 | 10 | 10 | --- | | 100 | 3 | - | 3 |
| 14. | Professional Skill Development-IV | 4 | -- | -- | 100 | -- | -- | -- | -- | --- | 100 | 4 | -- | 4 |
| 15. | Computer Applications in Civil Engineering-III | --- | 2 | -- | --- | -- | --- | --- | --- | 50 | 50 | --- | 1 | 1 |
| 16. | Civil Engineering Construction Practice | -- | 2 | -- | -- | -- | -- | -- | 50 | ---- | 50 | -- | 1 | 1 |
| | **Total** | **19** | **10** | **01** | **400** | **100** | **50** | **70** | **100** | **100** | **800** | **20** | **5** | **25** |

Total Credits

Semester III  = 25

semester IV  = 25

Grand Total   = 50

## 01: BUILDING PLANNING , DESIGN  AND BYELAWS

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTED: |
|---|---|---|
| Theory    : 3 Hours/ Week | End Semester Exam: 60Marks | 03 Credits |
| Practical : 1 Hour/ Week | Continuous Assessment : 40Marks | |
| | Term Work & Oral Exam: 50 Marks | 01 Credit |

| Course Pre-requsites: | |
|---|---|
| The Student Should have | |
| | |
| 1 | Fundamentals of Civil Engineering |
| 2 | Building Construction Practices |

| Course Objective: | |
|---|---|
| | To make the student understand the process of building planning and building byelaws |

| Course Outcomes: | |
|---|---|
| Student will be able to | |
| 1 | describe various types of buildings, their planning and building byelaws. |
| 2 | apply design considerations for climate, ventilation and lighting in building planning. |
| 3 | apply design considerations for Noise & acoustics, fire protection, Electrical & telecommunication and circulation in building planning. |
| 4 | apply design considerations for plumbing services in building planning. |
| 5 | explain the legal aspects of plan sanctioning. |
| 6 | explain the role of town planning authority and various presentation drawings. |

| Unit -I | Buildings, Types, Planning and Regulations : | (06 Hours) |
|---|---|---|
| | Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Principles of planning for building, Integrated approach necessity. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Types of drawings - Submission drawings, working drawings and Architectural drawing. | |

| Unit II | Building Services I | (06 Hours) |
|---|---|---|
| | (a)Climate - elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Thermal insulation of roof and wall. <br> (b)Ventilation and lighting - comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems. <br> (c) Noise and acoustics –Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics. | |
| Unit III | Building Services II | (06 Hours) |
| | (a) Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems, <br> (b)Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements. <br> (c)Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services. | |
| Unit IV | New Planning Concepts of Buildings | (06 Hours) |
| | Layout plans of different types of buildings, Design and planning of ECO Friendly building, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings. | |
| Unit V | Legal Aspects of Plan Sanctioning | (06 Hours) |
| | Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract, 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department. | |
| Unit VI | Town Planning and Presentation drawings | (06 Hours) |
| | (a) Necessity of town planning in India. Importance of safety, amenities and services, Development plan, Land use- zoning: Introduction to different zones of land in town planning, Requirements of residential zone, commercial industrial and agricultural zone, open areas, green belts and parks. <br> (b) Axonometric, Perceptive-One point and Two point. | |
| | | |
| Term work : It shall consist of : | | |

| | |
|---|---|
| 1. | Preparation of working drawings of any one of the buildings listed below:<br>   a) Residential Building<br>   b) Commercial Building<br>   c) Educational Building<br>   d) Industrial Building<br>   e) Recreational Building<br>   f) Health Club |
| 2. | Sheets to be drawn<br>   a) Plan/Typical floor plan to a suitable scale.<br>   b) Elevation and section to a suitable scale.<br>   c) Site plan showing water supply and Drainage<br>   d) Foundation Plan to a suitable scale. |
| 3. | Line plan of remaining five buildings. |
| 4. | Perspective Drawing of different objects. |

| Assignments: | |
|---|---|
| 1 | Study of building bye laws and D.C. rules of local authority |
| 2 | Study of different types of drawings. |
| 3 | Data collection with respect to climate , ventilation and lighting in building planning. |
| 4 | Study of various components of water supply and drainage system of buildings. |
| 5 | Case studies with respect to fire fighting of high rise building. |
| 6 | Case studies with respect to lift and escalators. |
| 7 | Study of constructional requirements with respect to electrical services in buildings. |
| 8 | Case studies of Ecofriendly and intelligent buildings. |
| 9 | Collecting information about legal aspects of building planning. |
| 10 | Writing report on development plan. |
| **Text Books** : | |
| 1. | Bindra Arora, "Building Construction", Laxmi Publication |
| 2. | M. L. Shah, C. M. Kale, S. Y. Patki, "Building Drawing with integrated approach to Built Environment", Tata McGraw Hill Publishers |
| 3. | Rangwala, "Town Planning" , Charaotar Publications |
| **References** : | |
| 3. | IS provisions "National Building Code" |
| 4. | "Development Control Rules" of local plan sanctioning authority |
| 5. | Calendar, "Time Saver Standards for Architectural Design", Tata McGraw Hill Publishers |
| 6. | Merit, "Building Design and Construction", Tata McGraw Hill Publishers |

| Syllabus for Unit Test: | |
|---|---|
| Unit Test I | Unit I, II, III |
| Unit Test II | Unit IV, V, VI |

# 02: APPLIED GEOLOGY

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:   03 Hours / Week | End Semester Examination: 60 Marks | 03 Credits |
| Practical: 02 Hours / Week | Unit Test: 20Marks | |
| | Assignment : 10 Marks | |
| | Attendance: 10 Marks | |
| | TW & Practical : 50 Marks | 01 Credits |

**Course Pre-requisites:**

The Students should have

| 1. | Basic knowledge of  engineering science |
|---|---|

**Course Objectives:**

To make students understand physical geology, mineralogy, petrology, structural & Indian geology, surface & sub surface water, geological investigation for tunnel, dam, reservoir & bridge

**Course Outcomes:**

| 1. | Students should be  able to identify  different rocks & minerals. |
|---|---|
| 2. | Students should be able to explain  Geology of River, Mountain earthquakes  & volcanism to decide the location ,type of foundation and type of civil engineering structure |
| 3. | Students should be able to identify different Geological structures  to decide location and type of civil engineering structure. |
| 4 | Students should be able to determine  influence of texture & structures of rocks on occurance of Ground water. |
| 5 | Students should be able to prepare Geological maps  and Geological sections  for subsurface investigations. |
| 6 | Student should be able to explain different methods of core drilling and core preservation |

| UNIT - I | **Physical Geology & Introduction to Engineering Geology:** | **(06 Hours)** |
|---|---|---|
| | Origin of Earth, Surface Relief of the earth, Earth Movement, Earthquake, Interior of the Earth, Volcanocity: Product of Volcanoes, types of mountains, Different Branches of Geology, Engineering Geology as a Subject. | |
| UNIT - II | **Mineralogy and Petrology:** | **(06 Hours)** |
| | Mineralogy: Formation Process of Minerals, Types of Minerals, Classification of Minerals. | |
| | Petrology- Rocks & minerals, Igneous rocks- mineral composition, texture, classification of igneous rock, study of common rock types, secondary rocks- weathering, texture & structure of sedimentary rocks & its classification, metamorphic rocks, agents & types of metamorphism, | |

| | | |
|---|---|---|
| | metamorphic textures<br>Building stones. | |
| **UNIT -<br>III** | **Structural Geology & Indian Geology:** | **(06<br>Hours)** |
| | Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures.<br><br>Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formation in peninsula. | |
| **UNIT -<br>IV** | **Water: Surface & Sub Surface** | **(06<br>Hours)** |
| | Surface Water: Geological action of running water, river valley development, normal & regional cycle of river erosion, waterfalls, ox-bow lakes, flood plane deposits, deltas, rejuvenation & resulting features,.<br><br>Sub - Surface Water: Types of Groundwater, depth zones of groundwater, perched water table, pervious & impervious rocks, geological work done by groundwater, natural springs & seepages, effect of pumping, cone of depression, circle of influence, conservation of groundwater, artesian wells, water bearing capacity of common rocks. | |
| **UNIT -<br>V** | **Geological Investigations** | **(06<br>Hours)** |
| | Preliminary geological investigations- use of geological maps & sections, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc., limitation of drilling, engineering significance of geological structures,<br><br>Tunneling- Influence of geological condition on design & construction method, preliminary geological investigations for tunnels, important geological considerations while choosing alignment, difficulties during tunneling, as related with lithology, nature & structure of materials to be excavated, role of groundwater, geological conditions likely to be troublesome, suitability of common rock types for tunneling, case studies. | |
| **UNIT -<br>VI** | **Geological Aspects at Dams, Reservoirs & Bridges** | **(06<br>Hours)** |
| | Geology of dam site- preliminary geological work at dam site, influence of geological condition on the choice of types & design of dam, favorable & unsuitable geological conditions for locating a dam i.e. landslide, treatment of leaky rocks & geological structures, case studies.<br><br>Geology of reservoir sites- Dependence of water tightness on physical properties & structures of rocks, geological conditions suitable & unsuitable | |

for reservoir sites, conditions likely to cause leakage through reservoir rim, importance of groundwater studies & effect of rising of water table, case studies.

Geology of Bridge Sites- Preliminary geological exploration for bridge piers & bridge abutments, scouring & erosion around bridge piers, influence of nature & structure of rocks on bridge foundation, case studies.

## List of Practicals / Term work:

1) Identification of the Minerals (Two Practical)
2) Identification of Igneous rocks (Two Practical)
3) Identification of Secondary rocks (Two Practical)
4) Identification of Metamorphic rocks (Two Practical)
5) Study of Contoured Geological Maps & drawing the sections (Six Practical)
6) Visit to site of Dam / Tunnel for understanding the geological features.

## Assignments

1) Collect and describe rock forming minerals & ore forming minerals
2) Collect and describe igneous rocks
3) Collect and describe secondary rocks
4) Collect and describe metamorphic rocks
5) Collect information and photographs of volcanoes
6) Collection of information about waterfalls & ox-bow lakes in India
7) Collection of data about different geological structures like folds, faults & unconformities
8) Conduct survey of ground water in India\
9) Conduct survey of geological conditions suitable for tunneling.
10) Conduct survey of geological conditions suitable for dam .

## References.

1) Gupte R. B., "A Text Book of Engineering Geology", P. V. G. Publications, Pune
2) Legget R., "Geology and Engineering", McGraw Hill Book Co., London
3) Trefethen J. M., "Geology for Engineers", D Van Nostrand Co. Inc.
4) Schultz J. R. and A. B. Cleaves, "Geology in Engineering", John Wiley Inc.
5) Engineering Geology & General Geology by Parbin Singh.
6) General Geology & Engineering Geology by Dr. P. T. Sawant, New Delhi Publication.

| Syllabus for Unit Test: | |
|---|---|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

# 03.ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

| TEACHING SCHEME | EXAMINATION SCHEME | CREDITS ALLOTTED |
|---|---|---|
| Theory:   03 Hours / Week | Continuous Assessment   40 Marks | 03 Credits |
| | | |
| | | |

**Course Pre-requisites:**

The Students should have knowledge of

| 1. | Civil Engineering |
|---|---|
| 2. | Mathematics |
| | |

**Course Objectives:**

| | To make students understand engineering economics and financial management |
|---|---|

**Course Outcomes:**  The Student will be able to

| 1. | The Student will be able to draw organization chart. |
|---|---|
| 2. | The Student will be able  find out time value of money. |
| 3. | The Student will be able select best project. |
| 4 | The Student will be able find out depreciation cost. |
| 5 | The Student will be able prepare balance sheet. |
| 6 | The Student will be able generate finance for his organization. |

| UNIT - I | **Elementary Economics** | **(06 Hours)** |
|---|---|---|
| | Definition of Economics, nature, scope and importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labor, capital and organization. | |
| UNIT - II | **Engineering Economics** | **(06 Hours)** |
| | Basic principles, time value of money, cash flow diagram. Equivalence-single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment. | |
| UNIT - III | **Project Economics Analysis** | **(06 Hours)** |
| | . Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio | |
| | | |

| UNIT - IV | **Depreciation and Value Engineering** | **(06 Hours)** |
|---|---|---|
| | Depreciation and methods of depreciations. Inflation, value engineering and value analysis. | |
| UNIT - V | **Financial Management** | **(06 Hours)** |
| | Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet, insurance audits and financial risk aspects | |
| UNIT - VI | **Project Budgeting** | **(06 Hours)** |
| | . Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economical policy. Role of financial institutions in economical development, RBI government of India guidelines for foreign funding in construction projects. | |

**Assignments**
1) Preparation of organization chart for small construction project
2) Preparation of organization chart for large construction project
3) Preparation of cash flow diagrams and finding out time value of money
4) Comparison of different projects by different methods
5) Benefit cost analysis of project
6) Determination depreciation value of equipments
7) Preparation of balance sheet for project
8) Assignment on value analysis
9) Collection of data regarding RBI government of India guide lines for foreign funding in construction project.
10) Numericals on engineering economics

**References Books**
1 Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
2 Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
3 Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
4 Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
5 Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
6 Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
7 Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
8 Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Indian Edition, Oxford University Press, 2010.

9  Ostwald, P. F., "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle River, New Jersey, 2001.

10  Peterson, S. J., "Construction Accounting and Financial Management", Pearson Education, Upper Saddle River, New Jersey, 2005.

11  Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., "Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.

12 Peurifoy, R. L. and Oberlender, G. D., "Estimating Construction Costs", 5th ed., McGraw-Hill, New Delhi, 2004.

13  Schexnayder, C. J. and Mayo, R. E., "Construction Management Fundamentals", International Edition, McGraw-Hill, 2003.

| Syllabus for Unit Test: | |
|---|---|
| Unit Test -1 | UNIT – I, II, III |
| Unit Test -2 | UNIT – IV, V, VI |

# 04 : MECHANICS OF SOLIDS

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:   04 Hours / Week | End Semester Examination: 60 Marks | 04 Credits |
|  | Continuous Assessment: 40 Marks |  |

**Course Pre-requisites:** The students should have knowledge of-

| 1. | Engineering Mechanics |
|---|---|

**Course Objectives:**

| | The student should be able to calculate stresses developed in the material. |
|---|---|

**Course Outcomes:** The student will be able to

| 1. | calculate stresses due to axial force. |
|---|---|
| 2. | calculate shear force and bending moment in the beam. |
| 3. | calculate bending stress and deflection in the beam. |
| 4 | calculate shear stress due to shear force and torsion. |
| 5 | calculate critical load for column. |
| 6 | calculate principal stresses. |

| UNIT - I | **Simple Stresses and Strains:** | **(08 Hours)** |
|---|---|---|
|  | Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law; Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section. |  |
| UNIT - II | **Shear Force and Bending Moment in Beams:** | **(08 Hours)** |
|  | Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments; |  |
| UNIT - III | **Bending Stresses and Deflection of Beam:** | **(08 Hours)** |
|  | Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section. Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve. |  |
| UNIT - IV | **Shear Stresses:** | **(08 Hours)** |
|  | Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section. Torsion of Circular Shafts: Theory, assumptions and derivation of torsional |  |

| | | | |
|---|---|---|---|
| | formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity. | | |
| UNIT - V | **Combined Stresses and Axially Loaded Column:** | | **(08 Hours)** |
| | Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. <br> Axially Loaded Long Columns: Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula, Determination of critical load. | | |
| UNIT - VI | **Principal Stresses and Principal Planes:** | | **(08 Hours)** |
| | Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion. | | |

| **Assignments:** | |
|---|---|
| 1 | Explain different types of stresses with practical example. |
| 2 | Write physical properties of different metals. |
| 3 | Draw shape of SFD and BMD for different types of loading. |
| 4 | Draw SFD and BMD for beams. |
| 5 | Draw bending stress distribution diagram across section |
| 6 | Calculate bending stress at particular point. |
| 7 | Draw deflected shape of beam for different support conditions. |
| 8 | Calculate slope and deflection at particular point. |
| 9 | Draw shear stress distribution diagram across section |
| 10 | Calculate shear stress at particular point. |
| 11 | Explain application of shafts in series and in parallel. |
| 12 | Calculate twist/torque/stresses in shaft. |
| 13 | Draw effect of combined axial and flexure stress. |
| 14 | Draw deflected shape of column under different support conditions. |
| 15 | Calculate critical load for column. |
| 16 | Explain principal stresses and strains. |
| 17 | Draw Mohr's circle for different stresses. |

| **Text Books:** | |
|---|---|
| 1) | R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall, |
| 2) | Rajput R. K., "Strength of Materials", S. Chand Publication |
| 3) | Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication. |
| 4) | Ramamrutham S. & Narayan R., "Strength of Materials", Dhanpat Rai Publishing Co. |

| **Reference Books:** | |
|---|---|
| 1) | Beer F..P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication |
| 2) | GereJ.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors |
| 3) | Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication |

| | |
|---|---|
| 4) Popov E. P., "Engineering Mechanics of Solids", Prentice Hall of India (P) Ltd. | |
| 5) Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication | |
| **Syllabus for Unit Test:** | |
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

# 05: CONCRETE TECHNOLOGY

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:  03 Hours / Week | End Semester Examination: 60 Marks | 03 Credits |
| | Continuous Assessment: 40 Marks | |
| | | |

| | |
|---|---|
| **Course Pre-requisites:** | |
| The Students should have knowledge of | |
| **1.** | Fundamentals of Civil Engineering |
| **2.** | Engineering Chemistry |
| **Course Objectives:** | |
| | The student should  know qualities & properties of concrete. |
| **Course Outcomes:** | |
| The student will be able to | |
| **1.** | test Ingredients of concrete. |
| **2.** | measure Workability of concrete. |
| **3.** | measure strength of Hardened concrete. |
| **4.** |  design of  Concrete Mix. |
| **5.** | describe Durability  of concrete. |
| **6.** | explain the use of Admixtures. |

| UNIT - I | **Ingredients of Concrete:** | **(06 Hours)** |
|---|---|---|
| | Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement. Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates. Water: Quality of water IS requirements, Use of sea water. | |
| UNIT - II | **Fresh Concrete:** | **(06 Hours)** |
| | Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding. Concreting Process: batching, mixing, transporting, placing and compaction. Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time. | |
| UNIT - III | **Hardened Concrete:** | **(06 Hours)** |
| | Properties of Hardened concrete Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile | |

| | strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength,Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve.<br>Non Destructive Testing: Schmidth's Rebound hammer, Ultrasonic Pulse velocity method. | |
|---|---|---|
| **UNIT - IV** | **Concrete Mix Design:** | **(06 Hours)** |
| | Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262 & IS: 456), Acceptance criteria. | |
| **UNIT - V** | **Admixtures in Concrete:** | **(06 Hours)** |
| | Purpose and functions, Classification Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test.<br>Mineral Pozzolanic/Admixtures:- Fly ash, Silica flume.<br>Self Compacting Concrete, Roller Compacted Concrete, Ready mix concrete; High Performance Concrete. | |
| **UNIT - VI** | **Special Concrete and Durability of Concrete:** | **(06 Hours)** |
| | Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Ferro-cement.<br>Special Concreting: Under water concreting, Cold weather concreting.<br>Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456. | |

**ASSIGNMENTS:**
1) To find the types of cement from market.
2) To find the different types, sizes, shapes of aggregate from market.
3) Measurement of workability of fresh concrete by different methods.
4) Describe the concreting process from any nearby site.
5) Describe the curing of concrete.
6) Design the concrete mix by different method.
7) Measurement of strength of hardened concrete.
8) Measurement of strength of hardened concrete by nondestructive testing.
9) Describe the concept of durability of concrete.
10)Explain the use of Admixtures in concrete.

**Text Books:**

1) Gambhir M. L., "Concrete Technology", Tata McGraw Hill Publication

2) Shetty M. S., "Concrete Technology", S. Chand & Company Ltd.

**Reference Books:**

1) Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication

| | |
|---|---|
| 2) Neville A. M., "Properties of Concrete", ELBS & Longman Publication | |
| | |
| | |
| **Syllabus for Unit Test:** | |
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

# 07: COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:   -- | End Semester Examination: -- | -- |
| Practical: 02 Hours / Week | Continuous Assessment:   -- | |
| | Term Work: 50 Marks | 01 Credit |

**Course Pre-requisites:**

The Students should have

| **1.** | Knowledge of basic building aspects. |
|---|---|
| **2.** | Knowledge of various building components. |
| **3.** | Knowledge of various building symbols. |

**Course Objectives:**

| | To make student capable of drawing any kind of Engineering drawing using AutoCAD. |
|---|---|

**Course Outcomes:**

The students will be able to

| **1.** | draw various Engineering drawing using AutoCAD. |
|---|---|
| **2.** | draw various elements of a building. |
| **3.** | draw various elevation and sections of the building. |

| | **CIVIL ENGINEERING SCOPE AND APPLICATIONS II** | |
|---|---|---|
| | | |
| • | Introduction. | |
| • | Getting Started. | |
| • | Learning commands: Draw and Modify Menu. | |
| • | Learning commands through drawings. | |
| • | Centerline drawings | |
| • | Layers / Filters | |
| • | Blocks | |
| • | Area Command | |
| • | Drawing Presentation :Sheet size and Text Format | |

**Term Work:**

1) Introduction to the software: Tool bars, Symbols and Various Commands.
2) Drawing Plates (minimum 10 in number)
3) Drawing Plan, Elevation and Section of G+1 Building.

**Text Books:**

**AutoCAD users Guide**

# 08: TESTING OF MATERIALS

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| | | |
| Practical: 02 Hours / Week | TW&Oral:50Marks | 01 Credit |
| | | |

**Course Pre-requisites:**

The Students should have

| **1.** | knowledge of Engineering Mechanics,Solid Mechanics & Concrete Technology. |
|---|---|

**Course Objectives:**

| | the student should able to test qualities & strength of the material. |
|---|---|

**Course Outcomes:**

The student will be able to test

| **1.** | Metals |
|---|---|
| **2.** | Cement |
| **3.** | Aggregates |
| **4.** | Concrete |

**Course Contents:**

The term work shall consist of minimum **TWELVE** experiments from list below.

| | **Metal: (min Four)** |
|---|---|
| 1 | Tension Test – Mild steel, Tor steel |
| 2 | Torsion test- Mild Steel |
| 3 | Direct Shear test- Mild Steel |
| 4 | Izod & Charpy Impact tests- Mild Steel, Aluminum, Brass, Copper |
| 5 | Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper |
| | **Cement: (min Two)** |
| 6 | Standard consistency and Setting time test on cement |
| 7 | Fineness test on Cement |
| 8 | Compressive strength of Cement |
| 9 | Soundness test on Cement |
| | **Aggregate: (min Two)** |
| 10 | Specific gravity of Aggregates |
| 11 | Fineness Modulus of Aggregate |
| 12 | Aggregate Impact Value |
| 13 | Aggregate Crushing Value |
| | **Concrete (min Four)** |
| 14 | Workability of Concrete & effect of admixture. |
| 15 | Compressive strength of Concrete |
| 16 | Flexural Test of Concrete |
| 17 | Split Tensile strength of Concrete |
| 18 | Non Destructive Test on concrete –Schmidth's Rebound hammer test |
| 19 | Bending test – Timber |
| 20 | Compressive Strength test- Bricks |

**Reference Books:**
  **01)** Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication
  **02)** Neville A. M., "Properties of Concrete", ELBS & Longman Publication
  **03)** IS Codes
  - IS-4926
  - IS-516
  - IS-2386
  - IS-1199
  - IS-383
  - IS-13360
  - IS-5242

| | | |
|---|---|---|
| **09: ENGINEERING MATHEMATICS-III** | | |
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 03 Hours / Week | End Semester Examination: 60 Marks | 04 Credits |
| Tutorial: 01 Hours / Week | Continuous Assessment: 40 Marks | |
| | | |

| | |
|---|---|
| **Course Pre-requisites:** | |
| The Students should have | |
| **1.** | basic knowledge of differentiation, integration and differential equation |
| **2.** | basic knowledge of vector algebra |
| | |
| **Course Objectives:** | |
| | To form mathematical model and solve mathematical problem in Civil Engineering |
| **Course Outcomes:** | |
| The student should be able to | |
| 1. | form mathematical modeling of systems using differential equations and solve the differential equations |
| 2. | apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc |
| 3. | analyze the numerical data by applying statistical methods |
| 4. | solve system of linear equation and ordinary differential equation by numerical methods |
| 5. | apply mathematical modeling of systems using partial differential equations and solve the partial differential equations. |
| 6. | apply vector integral calculus to solve various problems in Civil Engineering. |

| | | |
|---|---|---|
| **Unit - I** | **Unit I: Linear Differential Equations (LDE)** | **(06 Hours)** |
| | Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE. | |
| **Unit - II** | **Unit II: Applications of DE** | **(06 Hours)** |
| | Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Solution of Partial Differential Equations (**PDE**): $$1)\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2},$$ $$2)\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2},$$ $$3)\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$ by using Separation of variables Applications of PDE to problems of Civil and allied engineering. | |

| Unit - III | Unit III: Numerical Methods | (06 Hours) |
|---|---|---|
| | Numerical solutions of (i) System of Linear Equations by Gauss Elimination, Cholesky and Gauss-Seidel methods (ii) Ordinary Differential Equations by Euler's, Modified Euler's, Runge-Kutta $4^{th}$ order and Predictor-Corrector methods. | |
| Unit - IV | Unit IV: Statistics and Probability | (06 Hours) |
| | Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis,Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial,Poisson, Normal and Hypergometric; Test of Hypothesis: Chi-Square test | |
| Unit - V | Unit V: Vector Differential Calculus | (06 Hours) |
| | Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl,Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities | |
| Unit - VI | Unit VI: Vector Integral Calculus | (06 Hours) |
| | Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations. | |

**ASSIGNMENTS:**
1. Problems on Linear differential equation with constants coefficients.
2. Problems on Application of LDE and partial differential equations.
3. Problems on Numerical methods to solve system of algebraic equation and ordinary differential equation.
4. Problems on Statistical methods and probability distribution.
5. Problems on Vector identities and application of vector differential in mechanics.
6.Problems on Line integral, surface integral and volume integral .

**Text Books:**

1)Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).

2)Erwin KreyszigAdvanced Engineering Mathematics by (Wiley Eastern Ltd.).

**Reference Books:**

1)B.V. Raman Engineering Mathematics by Tata McGraw-Hill.

2)M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education.

3)Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.

4)B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.

5) P. N. Wartikar& J. N. WartikarApplied Mathematics Volumes I and II Pune VidyarthiGrihaPrakashan, Pune.

| Syllabus for Unit Test: | |
|---|---|
| Unit Test I | Unit - I, II, III |
| Unit Test II | Unit - IV, V, VI |

<div align="center">

**10: SURVEYING**

</div>

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTED: |
|---|---|---|
| Theory    : 3 Hrs/ Week | End Semester Exam: 60Marks | 03 Credits |
| Practical : 4 Hrs/ Week | Continuous Assessment : 40Marks | |
| | Term Work & Practical Exam: 50 Marks | 01 Credit |

| **Course Pre-requisites:** | |
|---|---|
| The Student Should have | |
| 1. | Basic concept of civil engineering. |
| 2. | Basics of mathematics and Geometry. |

| **Course Objective** | |
|---|---|
| 1. | To make students understand use of various instruments and process of surveying and levelling. |
| | |

| **Course Outcomes** | |
|---|---|
| The student should be able to | |
| **1.** | Explain the use of  linear measurements and prismatic compass in surveying. |
| **2.** | Describe the process of vertical measurements and contouring and calculate reduced levels. |
| **3.** | Describe the use of vernier theodolite for angular measurements and calculate coordinates of traverse stations. |
| **4.** | Calculate omitted measurements in traverse survey and describe permanent adjustments of theodolite. |
| **5.** | Explain various methods of  setting out curves and describe field procedure of curve setting. |
| **6.** | Explain use of plane table and minor instruments in surveying. |
| | |

| **UNIT - I** | **Linear measurement and Compass survey** | **(06 Hours)** |
|---|---|---|
| | Introduction to land surveying, linear measurements, Tapes and EDM-Construction, working and principle, Direct and Indirect methods of linear measurement and ranging, types of tapes, , locating details with offsets by swinging tape, open cross staff and laser square method, concept of scale, R.F. maps and plan. Study and use of topo sheets. Compass survey: Types of bearing and meridian other than magnetic meridian, local attraction and correction of local attraction, dip, declination, reduction of true bearings, adjustment of closing error. | |
| **UNIT - II** | **Vertical measurements and contouring.** | **(06 Hours)** |
| | Instruments for vertical measurement-dumpy level, auto level, laser level and digital level. Principle axes of dumpy level, temporary and permanent adjustment, simple, compound and reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring: Direct and indirect methods of contouring, uses of contour maps, profile levelling and cross sectioning and their applications, reduction of volume from contour map and tracing grade contour. | |
| **UNIT - III** | **Measurement of direction by Vernier Theodolite.** | **(06** |

| | | **Hours)** |
|---|---|---|
| | Study of Vernier transit 20" Theodolite, introduction to digital Theodolite use of Theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles and magnetic bearing, prolonging a line, lining in and setting out and angle with a Theodolite, plane trigonometrical levelling.<br>Theodolite traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gales traverse table. | |
| **UNIT-IV** | **Omitted measurements, permanent adjustments of transit Theodolite and Tachometry.** | **(06 Hours)** |
| | Omitted measurements, area calculation by independent co-ordinates, open traverse and its uses, measurement of deflection angles using transit Theodolite, open traverse survey and checks in open traverse.<br>Fundamental axes of Theodolite: testing and permanent adjustment of Theodolite Tachometry: applications and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points. | |
| **UNIT-V** | **Curves** | **(06 Hours)** |
| | Introduction to horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear methods, offsets from long chord and offsets from chord produced, angular method, Rankin's method of deflection angle.<br>Transition curves: necessity, types and requirements. | |
| **UNIT-VI** | **Plane table survey and construction survey.** | **(06 Hours)** |
| | Equipments required for plane table survey and their uses, methods of plane table survey: radiation, intersection, traversing, and simple resection, errors and precisions in plane table surveying, construction survey- survey for tunnels, drainage line buildings, and roads. Use of laser based electronic range finder. | |
| | **Term work:** | |
| | The term work shall consist of | |
| | Field book containing record of all exercises and project listed below. | |
| **a)** | Road project showing L-section plan Of road with contours and typical cross section | **2-sheets** |
| **b)** | Theodolite traverse survey project. | **1-sheets** |
| | **List of Practicals:** | |
| | Details of practicals to be performed, Exercise projects and assignments | |
| 1. | Linear measurements with tape and accessories. | |
| 2. | Study and use of auto level and double check leveling | |
| 3. | Compound leveling and fly leveling, calculation by rise and fall method. | |
| 4. | Two peg test for level. | |
| 5. | Study and use of 20" Vernier Theodolite. | |

| | | |
|---|---|---|
| 6. | Measurement of horizontal angle of triangle by repetition method and applying check. | |
| 7. | Measurement of vertical angle by transit Theodolite | |
| 8. | Trigonmetrical levelling by transit Theodolite. | |
| Project I | Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning. | |
| Project II | Theodolite traverse survey of closed traverse for minimum 0.5 hectares area including building roads etc. | |
| 9. | Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights. | |
| 10. | Introduction and study of outfit of plane table and method of radiation. | |
| 11. | Intersection method of plane table survey. | |
| 12. | Closed plane table traverse survey around a small four sided building. | |
| 13. | Setting out simple circular curve by Rankin's method of deflection angle | |
| 14. | Use of laser based electronic range finder. | |
| | | |
| | **ASSIGNMENTS:** | |
| | | |
| 1 | Computation of corrected bearings of the traverse by different methods. | |
| 2 | Solving problems on calculation of reduced levels by different methods. | |
| 3 | Preparing contour map of the area from the given spot levels. | |
| 4 | Study of topographical sheets to record various details shown. | |
| 5 | Solving problems on trigonometrical leveling. | |
| 6 | Computations of independent coordinates of a closed traverse. | |
| 7 | Solving problems on omitted measurements. | |
| 8 | Calculation of reduced level and distance of a point by tacheometry. | |
| 9 | Computation of data required to set out the simple circular curve by Rankine's method . | |
| 10 | Write details of survey for drainage line with proper sketches. | |
| | | |
| | | |
| | **Text Book:** | |
| 1 | Surveying and Levelling by Vol.II-T.P. Kanetkar and S.V. Kulkarni. | |
| 2 | Surveying Vol. I & II by Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain. | |
| 3 | Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan | |
| 4 | Plane Surveying------A.M. Chandra----- New age International Publishers | |
| 5 | Surveying and Levelling----N. N. Basak, Tata Mc-Graw hill | |
| 6 | Surveying Vol. I & II-----Dr. K. R. Arora. | |
| | **Reference Books:** | |
| 1 | Surveying: Theory and practice---James M. Anderson, Edward M. Mikhail | |
| 2 | Surveying theory and practices---Devise R. E., Foot F.S. | |
| 3 | Plane and Geodetic Surveying for Engineers. Vol. I—David clark. | |
| 4 | Principles of Surveying. Vol. I by J.G. Olliver, J.Clendinning | |

| | |
|---|---|
| 5 | Surveying Vol. I & II by S.K.Duggal, Tata Mc-Graw Hill. |
| 6 | Surveying and Levelling by Subramanian, oxford University Press. |

**Syllabus for Unit Test.**

| Unit Test I | Units I, II, III |
|---|---|
| Unit Test II | Units IV, V, VI |

# 11. MECHANICS OF FLUID

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTED: |
|---|---|---|
| Theory : 3 Hours / Week | End Semester Exam: 60Marks | 03 Credits |
| Practical : 2 Hours / Week | Continuous Assessment : 40Marks | |
| | Term Work & Oral Exam: 50 Marks | 01 Credit |

| | |
|---|---|
| **Course Pre-requsites:** | |
| The Student Should have | |
| 1 | Basic Knowledge of units and conversion of units |
| 2 | Basic Knowledge of Engineering Mathematics |
| 3 | Basic Knowledge of Engineering Physics |
| **Course Objective:** | |
| | To make the student understand the scope and application of Fluid Mechanics |
| **Course Outcomes:** | |
| Student should be able to | |
| 1. | describe basic properties of fluids and measure its properties in static conditions. |
| 2. | apply knowledge of fluid kinematics and dynamics conditions. |
| 3. | analyse physical phenomenon dimensionally. |
| 4. | explain laminar flow and flow through pipes |
| 5. | explain of boundary layer theory. |
| 6. | describe turbulent flow. |

| Unit -I | **Properties of Fluids & Statics:** | **(06 Hours)** |
|---|---|---|
| | Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids.<br>**Statics:** Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height. | |
| Unit II | **Kinematics** | **(06 Hours)** |
| | Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net. | |

| Unit III | **Kinetics** | **(06 Hours)** |
|---|---|---|
| | Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, , Impulse momentum equation. | |
| Unit IV | **Dimensional Analysis and Model Studies** | **(06 Hours)** |
| | Dimensional homogeneity, Important dimensionless parameters, Dimensional analysis using Buckingham's $\pi$ theorem, Model studies,  Similitude, Model laws, Types of models. | |
| Unit V | **Fundamental of Pipe Flow & Boundary layer theory** | **(06 Hours)** |
| | Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe ,Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer | |
| Unit VI | **Turbulent flow & Pipe Flow Problems** | **(06 Hours)** |
| | Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems. | |
| | | |

| **Term work shall consist of any Eight Exercises** | |
|---|---|
| 1. | Determination of Viscosity |
| 2. | Study of Pressure Measuring Devices |
| 3. | Study of Stability of Floating Bodies |
| 4. | Verification of Bernoulli's Theorem |
| 5. | Determination  of $C_d$ of Venturimeter |
| 6. | Determination  of $C_d$ of Orifice |
| 7. | Determination  of $C_d$ of Notch |
| 8. | Study of Laminar flow Using Heleshaw's / |
| 9. | Study of Laminar flow Using Reynold's Apparatus |
| T.W and Oral Examination shall be based on above termwork | |
| | |

| **ASSIGNMENTS :** Assignments will consist of | |
|---|---|
| 1. | Solution of numerical problems asked in recent three years of BVU question papers. |
| 2. | Solution of questions asked in recent three years BVU question papers. |
| 3. | Report of new topic being discussed in reputed research journals related to fluid mechanics. |

| | |
|---|---|
| 4. | Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics. |
| 5. | Writing of industrial applications of various topics of syllabus. |
| 6. | Design of new experiments related to fluid mechanics. |
| 7. | Collection of two fluid mechanics NPTEL videos and demonstration of it. |
| 8. | Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics. |
| 9. | Collection of information about fluid mechanics phenomenon and its explanation. |
| 10. | Collection of data of different fluids with reference to their properties. |

| **Text Books:** | |
|---|---|
| 1. | Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" Scitech Pulication |
| | C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications |
| 2. | S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company |
| 3. | R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications |
| 4. | R.K. Rajput "Fluid Mechanics" S Chand Publications |
| 5. | Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi |
| 6. | Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House |
| **Reference Books:** | |
| 1. | Streeter- Wylie,"Fluid Mechanics", TataMcGrow Hill Publication |
| 2. | Dr. R. J. Garde "Turbulent Flow" New Age Publications |
| 3. | N. Narayana Pillai "Principles of Fluid Mechanics and Fluid Machines" University Press |
| 4. | Edward J. Shaughnessy "Introduction to Fluid Mechanics" Oxford University Press |
| 5. | Baljeet S. Kapoor "Fluid Mechanics" New Age International Publishers |
| 6. | Vijay Gupta "Fluid Mechanics And Its Applications" New Age International Publishers |
| 7. | Robert W. Fox "Introduction to Fluid Mechanics" Willey Student Edition |
| 8. | John F. Douglas "Fluid Mechanics" Perason Publication |
| 9. | James A. Fay "Introduction to Fluid Mechanics" PHI Learning Private Limited |

| **Syllabus for Unit Test** | |
|---|---|
| Unit Test I | Unit I, II, III |
| Unit Test II | Unit IV, V, VI |

# 12: CONSTRUCTION TECHNIQUES & MACHINERIES

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:   03 Hours / Week | End Semester Examination : 60 Marks | 03 Credits |
| | Unit Test : 20 Marks | |
| | Assignment : 10 Marks | |
| | Attendance : 10 Marks | |

| | | |
|---|---|---|
| **Course Pre-requisites:** | | |
| The Students should have | | |
| **1.** | knowledge of Building Construction Practices, Building Planning & Design. | |
| **2.** | knowledge of Engineering Economics. | |
| **3.** | knowledge of Concrete Technology. | |
| **Course Objectives:** | | |
| | Students should get knowledge of Construction Operation Equipments & different methods of advanced construction techniques, tunneling, concreting & dewatering. | |
| **Course Outcomes:** | | |
| **1.** | Student will be able to explain erection techniques for high rise structures. | |
| **2.** | Student will be able to Apply different construction techniques in underwater construction. | |
| **3.** | Student will be able to apply grouting techniques. | |
| **4.** | Student will be able to find output of earth moving equipment. | |
| **5.** | Student will be able to explain soil stabilization techniques. | |
| **6.** | Student will be able to describe safety of equipment | |

| | | |
|---|---|---|
| **UNIT - I** | **CONSTRUCTION MECHANISATION & HIGH RISE CONSTRUCTIONS** | **(06 Hours)** |
| | Role of Construction activity in the National (including Urban & Rural) & Global development. Necessity of mechanization in construction industry. Types of construction such as Light, Medium & Heavy duty. Erection techniques for high rise structures, advantages & disadvantages of high rise structures. Scope of infrastructure in India and provisions made. | |
| **UNIT - II** | **UNDER WATER CONSTRUCTION** | **(06 Hours)** |
| | Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties. | |
| **UNIT - III** | **ADVANCED CONSTRUCTION TECHNIQUES** | **(06 Hours)** |

| | Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Placing of concrete in Hot & Cold weather conditions. Shotcreting & Gunieting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method. | |
|---|---|---|
| | | |
| UNIT - IV | **EARTH WORK MACHINERIES** | **(06 Hours)** |
| | Classification of Earth Moving machines (rippers, dragline, scrappers, pavers, backhoe) & factors affecting in selection. Group behavior of equipments. Manpower requirement for the equipments. Rollers, Tractors, Bull Dozers, Rippers, Draglines & Clamp Shells, Scrappers, Dumpers, Pavers, Power Shovels, Backhoe -: detailed study of these equipment with classification, uses, output, & economics. Excavating, Transporting & compaction equipments.  Importance of record keeping of machineries & mode of payment for them. | |
| UNIT - V | **HOISTING & CONVEYING EQUIPMENTS** | **(06 Hours)** |
| | Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling equipments. Crushers & its types. | |
| UNIT - VI | **DEWATERING, PAVING EQUIPMENTS & CONCRETE PUMPS** | **(06 Hours)** |
| | Dewatering Techniques; Electro-osmosis method, Well Point System. Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting. | |

 **ASSIGNMENTS :**

1) Enlist & explain role of construction activity in National & Global development. Explain scope of infrastructure in India & provisions made.

2) Define with examples; Light, Medium & Heavy construction.

3) Define & differentiate between Cofferdams & Caissons & briefly explain piles & its classification.

4) In context of tunneling, enlist different tunnel driving techniques & tunnel boring machines.

5) Write short notes on -:
   i.  Shotcreting
   ii.  Gunieting
   iii.  Trenchless technology
   iv.  Drill & Blast method
   v.  Pneumatic drilling equipments

6) Classify, discuss briefly various earth work machineries (any five) & factors affecting in

| |
|---|
| selection including their economics. |
| 7) Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics. |
| 8) Explain crushers & its types in detail. |
| 9) Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system). |
| 10) Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting. |
| 11) Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher. |
| |

**Textbooks / Reference Books:**

1) Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.
2) Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", Mc Graw Hill Book Company.
3) Russel James E., "Construction Equipment", Reston Publishing Company.
4) Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.
5) S.C. Sharma & Khanna, Construction Equipments & its Management",
6) V.R. Phadke "Construction Machinery & Works Management".

| **Syllabus for Unit Test:** | |
|---|---|
| Unit Test -1 | UNIT – I,   UNIT – II,  UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

# 13: STRUCTURAL ANALYSIS - I

| TEACHING SCHEME: | EXAMINATION SCHEME: | CREDITS ALLOTTED: |
|---|---|---|
| Theory:   03 Hours / Week | End Semester Examination: 60 Marks | 04 Credits |
| Tutorial: 01 Hours / Week | Continuous Assessment: 40 Marks | |
| | | |

**Course Pre-requisites:** The students should have knowledge of

| 1. | Solid Mechanics |
|---|---|

**Course Objectives:**

| | The student should be able to analyse the structure. |
|---|---|

**Course Outcomes:** The student will be able to

| 1. | calculate degree of indeterminacy of the structure. |
|---|---|
| 2. | calculate deflection of truss. |
| 3. | analyse Indeterminate truss using strain energy method. |
| 4 | calculate fixed end moments. |
| 5 | analyse plane structure using slope deflection method. |
| 6 | analyse plane structure using moment distribution method. |

| UNIT - I | **Basic Concepts:** | **(06 Hours)** |
|---|---|---|
| | Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beam and frame. <br> Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axially force, shear force, bending moment and torsional moment. | |
| UNIT- II | **Deflection of Beam and Truss:** | **(06 Hours)** |
| | Deflection of determinate beam using conjugate beam method, Deflection of joints of determinate truss using Castigliano's first theorem | |
| UNIT-III | **Analysis of Indeterminate Plane Trusses using Castigliano's theorem:** | **(06 Hours)** |
| | Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Lack of fit, temperature changes and Sinking of support. | |
| UNIT - IV | **Fixed Beam and Clapeyron's Three Moment Theorem:** | **(06 Hours)** |
| | Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. <br> Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support. | |
| UNIT - V | **Slope Deflection Method:** | **(08 Hours)** |

| | Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees); | |
|---|---|---|
| **UNIT - VI** | **Moment Distribution Method:** | **(08 Hours)** |
| | Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees). | |

| **Assignments:** | | |
|---|---|---|
| 1 | Draw different types of structures- space, plane, trusses, beams and frames. | |
| 2 | Draw deflected shapes of different types of structures | |
| 3 | Calculate degree of static indeterminacy. | |
| 4 | Calculate degree of kinematic indeterminacy. | |
| 5 | Calculate deflection of beam using conjugate beam method. | |
| 6 | Calculate deflection of truss using Castigliano's first theorem. | |
| 7 | Analysis of indeterminate trusses using Castigliano's second theorem | |
| 8 | Write fixed end moments for different loading cases. | |
| 9 | Explain three moment theorem | |
| 10 | Analysis beam/frame using slope deflection method | |
| 11 | Calculate distribution factor at joint. | |
| 12 | Analysis non-sway beam/frame using moment distribution method | |
| 13 | Analysis sway frame using moment distribution method | |
| | | |

| **Text Books:** | |
|---|---|
| 1) | Hibbeler R. C., "Structural Analysis", Prentice Hall Publication |
| 2) | Pandit G. S. & Gupta S. P., "Theory of Structures Vol-I", Tata McGraw Hill Publication |
| 3) | Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company |

| **Reference Books:** | |
|---|---|
| 1) | Prakash Rao D. S., "Structural Analysis", Universities Press Publication |
| 2) | Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication |
| 3) | Aslam Kassimali, "Structural Analysis", Cengage Learning. |
| | |

| **Syllabus for Unit Test:** | |
|---|---|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

# 15: COMPUTER APPLICATION IN CIVIL ENGINEERING - III

| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
|---|---|---|
| Practical: 02 Hours / Week | Term work and Practical: 50 Marks | 01 Credits |
| | | |

| **Course Pre-requisites:** The students should have knowledge of ||
|---|---|
| **1.** | Engineering Mechanics |
| **2.** | Solid Mechanics |
| **3.** | Structural Analysis-I |
| **Course Objectives:** ||
| | The student should be able to analyse the structure using STAAD.Pro |
| **Course Outcomes:** The student will be able to ||
| **1.** | analyse the beams |
| **2.** | analyse the plane frames. |
| **3.** | analyse the plane truss. |
| **4** | Analyse the structure space. |

| | | |
|---|---|---|
| | **Introduction to STAAD.Pro:** Application of software, Getting started, Introduction to Tool bars, Menu bar, working window, settting units, , Local and Global Co-ordinate system etc. | |
| | **Generation of Model:** Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, run analysis, read input file etc | |
| | **Results and Interpretation:** Post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection and stresses-their values and graphs. Results from output file, read output file and Interpret the results. | |

**Term work:** Term work consist of assignments on

1) Analysis of beams
2) Analysis of plane frames
3) Analysis of plane trusses

**Practical:** The practical examination is based on above syllabus and term work.

**Reference Books:**

1) T.S. Sharma, "Staad.Pro v8i for beginners" , Notion Press
2) Sivakumar Naganathan, "Learn Yourself STAAD.Pro V8i",Lap Lambert
3) Bentley Structures, "Staad.Pro Technical reference manual", Bentley Community e-book

# 16: CIVIL ENGINEERING CONSTRUCTION PRACTICE

| TEACHING SCHEME | EXAMINATION SCHEME | CREDITS ALLOTTED |
|---|---|---|
| Practical: 02Hrs/Week | TW & Oral Exam: 50 marks | 01Credits |

| **Course Pre-requisites:** | |
|---|---|
| The Student Should have knowledge of | |
| 1. | Fundamental of Civil engineering. |
| 2. | Building Construction |
| 3. | Engineering mathematics. |
| 4. | Concrete Technology |
| 5. | Building Planning, Designing and Bylaws |

| **Course Objective** | |
|---|---|
| 1. | To make students understand Civil Engineering Practices. |
| | |

| **Course Outcomes** | |
|---|---|
| The students will be able to | |
| 1. | setout of foundation for buildings. |
| 2. | carry out testing of construction materials |
| 3. | manage inventory on site. |
| 4. | maintain quality control on site. |
| 5. | work as a site engineer |
| | **List of Practicals (Any 10)** |
| 1. | Setting out and layout of building foundation. |
| 2. | Study of various types of drawings required on construction sites |
| 3. | Study of reinforcement and its bending for different structural members. |
| 4. | Slump test on concrete and effect of plasticizers. |
| 5. | Study of formwork& scaffolding. |
| 6. | Construction of different types of brick masonry bonds, study of recent types of bricks and blocks |
| 7. | Study of plastering & pointing. |
| 8. | Study of different types of tiles. |
| 9. | Introduction to water supply & sanitary fittings and appliances. |
| 10. | Consealed construction practices. |
| 11. | Types of paints. |
| 12. | Methods of Waterproofing of toilets & roofs. |
| 13. | Testing of concrete cubes of of different grades. |
| 14. | Study of stock register format and daily report. |
| 15. | Study of construction of concrete walls |
| 16. | Study of precast techniques |
| 17. | Study of Deck Slab |
| 18. | Study of Advance Water proofing Techniques |
| | |

| **Reference Books:** | |
|---|---|
| 1. | A to Z Building Construction by Mantri publication. |
| 2. | My Construction Practices by R.B. Chaphalkar. |