



Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu-515 002 (A.P) India

II year B.Tech Course Structures and Syllabi under R19 Regulations

| JNTUA Curriculum |
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| Civil Engineering B. Tech Course Structure |

2nd Year Course Structure

| Semester – 3 (Theory - 7, Lab – 3,MC-1) | | | | | |
|--|------------------|--|-----------------|--------------|----------------|
| S.No | Course No | Course Name | Category | L-T-P | Credits |
| 1. | 19A54301 | Complex Variables, Transforms and Partial Differential Equations | BS | 2-1-0 | 3 |
| 2. | 19A01301T | Strength of Materials-I | PC | 2-1-0 | 3 |
| 3. | 19A01302T | Fluid Mechanics | PC | 2-1-0 | 3 |
| 4. | 19A01303T | Surveying | PC | 2-1-0 | 3 |
| 5. | 19A01304 | Building Materials and Construction | PC | 2-0-0 | 2 |
| 6. | 19A05304T | Python Programming | ES | 2-1-0 | 3 |
| 7. | 19A52301 | Universal Human Values | HS | 2-0-0 | 2 |
| 8. | 19A01301P | Strength of Material Lab | PC | 0-0-3 | 1.5 |
| 9. | 19A01302P | Fluid Mechanics Lab | PC | 0-0-3 | 1.5 |
| 10. | 19A01303P | Surveying Lab | PC | 0-0-3 | 1.5 |
| 11. | 19A99301 | Environmental Science | MC | 3-0-0 | 0 |
| Total: | | | | | 23.5 |

| Semester - 4 (Theory - 6, Lab – 2, MC-1) | | | | | |
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| S.No | Course No | Course Name | Category | L-T-P | Credits |
| 1. | 19A01401 | Strength of Materials-II | PC | 2-1-0 | 3 |
| 2. | 19A01402T | Hydraulics and Hydraulic Machinery | PC | 2-1-0 | 3 |
| 3. | 19A01403 | Structural Analysis-I | PC | 2-1-0 | 3 |
| 4. | 19A01404T | Concrete Technology | PC | 3-0-0 | 3 |
| 5. | 19A01405T | Transportation Engineering | PC | 3-0-0 | 3 |
| 6. | 19A01406 | Environmental Engineering | PC | 3-0-0 | 3 |
| 7. | 19A01402P | Hydraulic Machinery Lab | PC | 0-0-3 | 1.5 |
| 8. | 19A01405P | Transportation Engineering Lab | PC | 0-0-3 | 1.5 |
| 9. | 19A99302 | Biology For Engineers | MC | 3-0-0 | 0 |
| Total: | | | | | 21 |

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B.Tech – II-I Sem

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19A54301 COMPLEX VARIABLES, TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to MECH & CIVIL)

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The aim is to analyze the solutions of partial differential equations.

UNIT-I

Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations ($\sin z$, e^z , $\cos z$, z^2) Mobius transformations (bilinear) and their properties.

Unit Outcomes:

Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions .
- Understand the conformal mappings of complex functions.

UNIT-II

Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof); power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving

sine and cosine, Evaluation of certain improper integrals (around UNIT circle, semi circle with $f(z)$ not having poles on real axis).

Unit Outcomes:

Students will be able to

- Understand the integration of complex functions.
- Apply Cauchy's integral theorem and Cauchy's integral formula.
- Understand singularities of complex functions.
- Evaluate improper integrals of complex functions using Residue theorem.

UNIT-III: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – UNIT step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Unit Outcomes:

Students will be able to

- Understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
- Find the Laplace transforms of general functions using its properties.
- Understand Laplace transforms of special functions (UNIT step function, UNIT Impulse & Periodic).
- Apply Laplace transforms to solve Differential Equations.

UNIT-IV: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula- Complex form of Fourier series.

Unit Outcomes:

Students will be able to

- Understand finding Fourier series expression of the given function.
- Determine Fourier coefficients (Euler's) and identify existence of fourier series of the given function.
- Expand the given function in Fourier series given in half range interval.

- Apply Fourier series to establish Identities among Euler coefficients.
- Find Fourier series of wave forms.

UNIT-V: Partial Differential Equations & Applications

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of first order PDEs by Lagrange's method- Solution of non linear PDEs (Standard forms)-Solution of second order PDEs by Method of separation of variables – Solutions of one dimensional wave equation, one dimensional heat equation under initial and boundary conditions.

Unit Outcomes:

At the end of this UNIT, the students will be able to

- Form Partial Differential Equations.
- Solve Partial Differential Equations of first order.
- Understand the method of separation of variables.
- Solve applications of Partial Differential Equations.

Course Outcomes:

After the completion of course, students will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms.
- Evaluate the Fourier series expansion of periodic functions.
- Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation.

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers, India.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

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19A01301T STRENGTH OF MATERIALS-I

Course Objectives:

- To make the student understand how to resolve forces and moments in a given system
- To demonstrate the student to determine the centroid and second moment of area
- To impart procedure for drawing shear force and bending moment diagrams for beams.
- To make the student able to analyze flexural stresses in beams due to different loads.
- To enable the student to apply the concepts of strength of materials in engineering applications and design problems.

UNIT-I

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems- **Center of Gravity and moment of inertia:** Introduction – Centroids of rectangular, circular, I, L and T sections - Centroids of built up sections. **Area moment of Inertia:** Introduction – Definition of Moment of Inertia of rectangular, circular, I, L and T sections - Radius of gyration. Moments of Inertia of Composite sections.

Unit Outcomes:

- Understand the basic concepts of forces
- Draw Free body Diagrams for forces
- Determine the centroid and moment of inertia for different cross section areas

UNIT – II

Simple Stresses and Strains:

Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of Varying section – Composite bars – Temperature stresses. Strain energy – Resilience – Gradual, Sudden, impact and shock loadings – simple applications.

Unit Outcomes

- Understand concepts of stresses, strains, elastic moduli and strain energy.
- Evaluate relations between different moduli
- Understand different type's loadings

UNIT – III

Shear Force and Bending Moment:

Definition of beam – types of beams – Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over hanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam.

Unit Outcomes

- Draw the shear force and bending moment diagrams for cantilevers, simply supported beams and Overhanging beams with different loads
- Understand the relationship between shear force and bending moments

UNIT – IV

Flexural Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/Y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel Sections – Design of simple beam sections.

Unit Outcomes

- Derive bending equations
- Compute the flexural stresses for different cross sections.
- Design beam sections for flexure

UNIT – V

Shear Stresses:

Derivation of formula-Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections. Combined bending and shear.

Analysis of trusses by Method of Joints & Sections.

Unit Outcomes

- Determine shear stresses for different shapes.
- Evaluate effect of combined bending and shear on sections

Course Outcomes:

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

- Understand the different types of couples and force systems
- Determine the centroid and moment of inertia for different cross-sections
- Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy.
- Develop shear force and bending moment diagrams for different load cases.
- Compute the flexural stresses and shear stresses for different loading cases and different cross-sections.

Text Books:

1. S. Timoshenko, D.H. Young and J.V. Rao, "Engineering Mechanics", Tata McGraw-Hill Company.
2. Sadhu Singh, "Strength of Materials", 11th edition 2015, Khanna Publishers.

References:

1. S.S.Bhavikatti, "Strength of materials", Vikas publishing house Pvt. Ltd.
2. R. Subramanian, "Strength of Materials", Oxford University Press.
3. R. K. Bansal, "Strength of Materials", Lakshmi Publications House Pvt. Ltd.
4. R.S. Khurmi and N.Khurmi, A text book of "Strength of Materials" "(Mechanics of Solids)", S Chand and Company Limited, Ramnagar, New Delhi-110 055

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19A01302T FLUID MECHANICS

Course Objectives:

To explain concepts of fluid mechanics used in Civil Engineering.

- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics
- To enable the students measure quantities of fluid flowing in pipes, tanks and channels
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

UNIT -I:

Basic concepts and definitions:

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapor pressure, boiling point, surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Unit Outcomes

1. Understand basic characteristics of fluids
2. Understand Newton's Law of Viscosity

UNIT -II:

Fluid statics:

Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Unit Outcomes

- Understand concepts of fluid statics.
- Understand different equipment and their applications.
- Demonstrate stability of floating bodies

UNIT -III:

Fluid kinematics:

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -dimensional continuity equations in Cartesian coordinates.

Unit Outcomes

- Understand fundamentals of fluid kinematics
- Understands different types of fluid flows
- Derivation of Continuity equations of using Cartesian coordinates

UNIT -IV:

Fluid Dynamics:

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

Unit Outcomes

- Demonstrate applications of Bernoulli's equations
- Experiment with different equipments under fluid flow
- Apply principles of fluid dynamics along with governing equations.

UNIT -V:

Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

Unit Outcomes

- Estimate Energy losses in pipelines
- Determine flow characteristics through Pipes.

Course Outcomes:

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

- Understand the principles of fluid statics, kinematics and dynamics
- Familiarize basic terms used in fluid mechanics
- Understand flow characteristics and classify the flows
- Apply the continuity, momentum and energy principles
- Estimate various losses in flow through channels

Text Books:

1. P. M. Modi and S. M. Seth, “Hydraulics and Fluid Mechanics”, Standard Book House
2. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, “Fluid Mechanics and Machinery”, Oxford University Press, 2010.

References:

1. S.C.Gupta, “Fluid Mechanics and Hydraulic Machines”, Pearson publication
2. R. K. Bansal, A text of “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications (P) Ltd., New Delhi.
3. K. Subrahmanya, “Theory and Applications of Fluid Mechanics”, Tata McGraw Hill
4. N. Narayana Pillai, Principles of “Fluid Mechanics and Fluid Machines”, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
5. K. Subramanya, Open Channel flow, Tata Mc.Grawhill Publishers.

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19A01303T

SURVEYING

Course Objectives:

- To make the student to get well conversant with the fundamentals of various basic methods and instruments of surveying.
- To introduce to the students in identifying reduced level of the ground and its profile for finding areas and volumes of embankments and cuttings.
- To make the student to use angular measuring instruments for horizontal and vertical control.
- To enable the student to set simple horizontal curves.
- To introduce the knowledge construction surveys and usage of modern instrument such as total station.

UNIT – I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

Plane table surveying: Introduction, accessories, setting up of plane table, techniques, testing, adjustments, errors, advantages and disadvantages.

Unit Outcomes

- To impart basic concepts of surveying.
- To introduce the usage and applications of linear and angular measurements through chain, tape, compass and plane table.

UNIT - II

Levelling - Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes: Areas - Determination of areas consisting of irregular boundary and regular boundary, Planimeter. Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

Unit Outcomes

- To impart basic principles in levelling and contouring.
- To calculate the areas of irregular boundaries and volumes of earth work quantities.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

Unit Outcomes

- To impart basic principles in Trigonometric levelling.
- To inculcate the knowledge of traversing.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple circular curve, setting out of simple horizontal circular curves.

Unit Outcomes

- To impart basic principles in Tacheometric surveying.
- To inculcate the knowledge of simple horizontal circular curve setting.

UNIT - V

Construction surveys: Introduction-staking out buildings-pipelines and sewers-highways-culverts. Bridge surveys-determining the length of a bridge-locating centres of piers- surface surveys and tunnel alignment-underground surveys-connection of surface and underground surveys-levelling in tunnels.

Total station Surveying: Basic principles, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments.

Unit Outcomes:

- To induce the knowledge of construction surveying.
- To inculcate the knowledge of advanced surveying instrument such as total station.

Course Outcomes:

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

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments
- Estimate the volumes of earth work
- Able to use modern survey instruments.

Text Books:

1. S.S Bhavikatti, “Surveying theory and Practice”, 2nd edition, Dreamtech press, Wiley distributors.
2. C.Venkatramaiah, “Text book of surveying”, 2nd edition, Universities press, 2018
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System – “Theory and Practice”, Springer -Verlag Publishers, 2001.

References:

1. Arthur R Benton and Philip J Taety, “Elements of Plane Surveying”, McGraw Hill – 2000.
2. Arora K R “Surveying” Vol 1, 2 & 3, Standard Book House, Delhi, 2004.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, “Surveying” (Vol – 1, 2 & 3), - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, “Plane Surveying”, New Age International Pvt. Ltd., New Delhi, 2002.
5. Bhavikatti “Surveying” Vikas publishing house ltd.
6. S K Duggal, “Surveying” (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. R. Agor Khanna Publishers 2015 “Surveying and leveling”.
8. R. Subramanian, “Surveying and leveling” Oxford university press, New Delhi.
9. Chandra A M, “Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
10. S.S Bhavikatti “Surveying and Levelling”, Vol. 1 and 2, Dreamtech press, Wiley distributors.

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B.Tech – II-I Sem

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19A01304

BUILDING MATERIALS AND CONSTRUCTION

Course objectives:

- To impart knowledge on basic building materials such as stone and clay products.
- To teach properties of binding materials such as gypsum, lime and cement.
- To disseminate knowledge on ferrous and non ferrous materials and its applications.
- To explain basic concepts of building components such as stair case and masonry.
- To describe the properties and applications of plumbing, electrical and sanitary fittings.
- To explain the methodology of surface finishes such as pointing, distempering and painting.

UNIT – I

Basic Building materials

Properties and characteristics of Basic building materials – Stone –characteristics of good building stone-types of stone masonry - bricks –characteristics of good quality bricks-manufacturing of bricks-types of bonds in brick work- Cavity wall & hollow block construction - tiles-types of tiles- sand –sources of sand – properties of sand.

Unit Outcomes:

- To understand the properties of stones,.
- To understand the properties of Bricks.
- To understand the properties of Tiles and sand.

UNIT – II

Binding Materials

Properties and characteristics of Binding materials – **Gypsum:** properties of gypsum plaster, building products made of gypsum and their uses. **Lime:** Manufacture of lime, classifications of limes, properties of lime- putty-characteristics and usage **Cement:** Raw materials used, Process of Manufacturing, Chemical composition, Bouge`s Compounds - Types of cement, Tests on cement – Uses of cement.

Unit Outcomes:

- To understand the properties of Gypsum.
- To understand the properties of Lime.
- To conduct test on Cement.

UNIT – III**Ferrous & Non-Ferrous Materials**

Steel – characteristics of reinforcing steel – Hardness, Tensile, Compression, Impact, wear, and corrosion testing, Micro hardness and indentation fracture toughness, Creep and stress rupture tests, fatigue testing – steel fibers and its applications – **Plastics**: classification, advantages of plastics, Mechanical properties and use of plastic in construction – polypropylene fibers and its applications – **Glass**: Ingredients, properties, types and use in construction – Glass fibers and its applications

Unit Outcomes:

- To conduct various tests for determining the characteristics of steel
- To understand the properties of Plastics as building material
- To understand the properties of glass as building material.

UNIT – IV**Basics of Building Components:**

Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, Vertical circulation means: stair cases and their types. Different types of floors, and flooring materials.

Unit Outcomes:

- To understand the construction procedure of staircase.
- To understand the construction procedure of various types of floorings

UNIT – V:**Internal and External Fittings of a Building:**

Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof – Lintels and Chajjas, Water Supply and Sanitary fittings (Plumbing), Electric Fittings, Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Plastering and its types, pointing, Distempering, Colour washing, Painting .

Unit Outcomes:

- To understand the components of doors and windows
- To gain knowledge on plumbing and electrical fittings in building construction
- To learn the procedures for surface finishes such as Plastering, Pointing and Painting

Course Outcomes:

At the end of the course, the student will be able

- To understand the characteristics of various building materials such as stone and clay product.
- To evaluate the properties of the binding materials for their suitability in building construction.
- To apply the ferrous and non-ferrous materials in building construction.
- To understand the construction procedure of various building components such as stair cases, masonry and flooring.
- To understand the installation of electrical, sanitary and plumbing fittings in buildings.

Text Books:

1. S K Duggal, "Building Materials" New Age International
2. BC Punmia, "Building Construction" Laxmi Publication.
3. G.C Sahu and Joygopal Jena, "Building materials and construction", Mc Graw Hill Education

References:

1. PC Varghese, "Building Materials" PHI
2. Mehta, "Building Construction Principles, Materials & Systems" 2/e, Pearson Education Noida.
3. Sandeep Mantri, "Practical building Construction and its Management" Satya Publisher, New Delhi.
4. Adams, "Adams' Building Construction Adams" CRC Press Taylor & Francis Group.

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19A05304T

PYTHON PROGRAMMING

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

UNIT – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Unit Outcomes:

Student should be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

UNIT – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, more recursion, Leap of Faith, Checking types,

Unit Outcomes:

Student should be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

UNIT – III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit Outcomes:

Student should be able to

- Use the data structure list.
- Design programs for manipulating strings.

UNIT – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions:

Unit Outcomes:

Student should be able to

- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

UNIT – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The __str__ method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Unit Outcomes:

Student should be able to

- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Course Outcomes:

Student should be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

Text Books:

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

Reference Books:

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

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19A52301 UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

(Common to all)

Introduction:

This course discusses the role of human values in one's family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course names as "H-102 Universal Human Values 2 : "Understanding Harmony" is designed which may be covered in their III or IV Semester.

In the Induction Program, students would get an initial exposure to human values through Universal Human Values-I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Unit 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration—what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations

- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Unit 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantik, 1999.
2. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth”
5. E. F. Schumacher. “Small is Beautiful”
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa “Economy of Permanence”
8. Pandit Sunderlal “Bharat Mein Angreji Raj”
9. Dharampal, “Rediscovering India”
10. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor’s role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one’s own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up “ordinary” situations rather than “extra-ordinary” situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

OUTCOME OF THE COURSE:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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STRENGTH OF MATERIALS LABORATORY

Course objectives:

By performing this laboratory, the student will be able to know the structural behavior of various materials.

- Tension test.
- Bending test on (Steel/Wood) Cantilever beam.
- Bending test on simply supported beam.
- Torsion test.
- Hardness test.
- Compression test on Open coiled springs
- Compression test on Closely coiled springs
- Compression test on wood/ concrete
- Izod / Charpy Impact test on metals
- Shear test on metals
- Use of electrical resistance strain gauges.
- Continuous beam – deflection test.

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the structural behaviour various structural elements when subjected to external loads

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FLUID MECHANICS LABORATORY

Course objectives:

By performing this laboratory, the student will be able to know the fluid flow measurements by considering different types flow measurement devices.

- Verification of Bernoulli's equation.
- Calibration of Venturimeter.
- Calibration of Orifice meter
- Determination of Coefficient of discharge for a small orifice by constant head method.
- Determination of Coefficient of discharge for a small orifice by variable head method.
- Determination of Coefficient of discharge for an external mouth piece by Constant head method.
- Determination of Coefficient of discharge for an external mouth piece by variable head method.
- Calibration of contracted Rectangular Notch.
- Calibration of contracted Triangular Notch.
- Determination of friction factor
- Determination of loss of head in a sudden contraction.
- Determination of loss of head in a sudden Expansion.

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes.

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SURVEYING LABORATORY

Course objectives:

By performing this laboratory, the student will be able to know the usage of various surveying equipments and their practical applicability.

- Setting up of Right angles using cross staff
- Plane table survey; finding the area of a given boundary
- Two Point Problem by the plane table survey.
- Fly levelling: Height of the instrument method and rise and fall method.
- Fly levelling; Longitudinal Section and Cross sections of a given road profile.
- Theodolite Survey: Determining the Horizontal and Vertical Angles
- Finding the distance between two inaccessible points using Theodolite
- Tachometric survey: Heights and distance problems using tachometric principles.
- One Exercise on Curve setting.
- Total Station Determination of area using total station. Traversing and Contouring
- Total Station: Determination of Remote height.
- Developing a Contour map

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, levelling, theodolite surveying and total station

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19A99301 ENVIRONMENTAL SCIENCE

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

UNIT – I

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit Outcomes

- To know the importance of public awareness
- To know about the various resources

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Course Outcomes:

- To know about various echo systems and their characteristics
- To know about the biodiversity and its conservation

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid Waste Management : Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Course Outcomes:

- To know about the various sources of pollution.
- To know about the various sources of solid waste and preventive measures.
- To know about the different types of disasters and their managerial measures.

UNIT – IV

Social Issues And The Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act –

Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Course Outcomes:

- To know about the social issues related to environment and their protection acts.
- To know about the various sources of conservation of natural resources.
- To know about the wild life protection and forest conservation acts.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Unit Outcomes:

- To know about the population explosion and family welfare programmes.
- To identify the natural assets and related case studies.

Course Outcomes:

At the end of the course, the student will be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

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STRENGTH OF MATERIALS-II

Course Objectives

- To teach the student with basic concepts for determination of principal stresses and strains in various structural elements.
- To demonstrate analytical methods for determining strength & stiffness and assess stability of structural members.
- To make the student analyze circular shafts subjected to torsion
- To make the student determine critical loads for columns with different end conditions.

UNIT-I

Compound Stresses and Strains:

Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, and its applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain.

Unit Outcomes:

- Identify critical planes in two dimensional stress systems
- Estimate principals stresses
- Assess safety of structural elements under principal stresses

UNIT -II

Deflection of Beams:

Uniform bending – slope, deflection and radius of curvature – Differential equation for elastic line of a beam – Double integration and Macaulay's methods. Determination of slope and deflection for cantilever and simply supported beams under point loads, U.D.L. uniformly varying load-Mohr's theorems – Moment area method – application to simply supported and overhanging beams- analysis of propped cantilever beams under UDL and point loads.

Unit Outcomes:

- Understand types of loads acting on beams
- Compute slopes and deflections of beams with different boundary conditions
- Evaluate effect of different loads on propped cantilever beams

UNIT -III**Torsion:**

Theory of pure torsion – Assumptions and Derivation of Torsion formula for circular shaft – Torsional moment of resistance – Polar section modulus – power transmission through shafts – Combined bending and torsion –. Springs - Types of springs – deflection of close coiled helical springs under axial pull and axial couple – Carriage or leaf springs.

Unit Outcomes

- Analyze members subjected to torsion, combined torsion and bending moment
- Calculate power transmission through shafts
- Estimate energy absorption in springs.

UNIT -IV**Direct and Bending stresses:**

Introduction-eccentric loading – columns with eccentric loading – symmetrical columns with eccentric loading about one axis –about two axes – Unsymmetrical columns with eccentric loading – limit of eccentricity.

Theories of failure:

Maximum Principal stress theory- Maximum shear stress theory- Maximum strain theory- Maximum strain energy theory-Maximum distortion energy theory

Unit Outcomes:

- To know about the effect of eccentricity effect in columns
- To know about the various theories of failures.

UNIT -V**Columns and Struts:**

Introduction – classification of columns – Axially loaded compression members – Euler's crippling load theory – derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – eccentric loading and Secant formula – Prof. Perry's formula.

Unit Outcomes

- Classify columns
- Understand Euler's theory on columns and assess crippling loads
- Analyze compression members using different theories
- Assess load carrying capacity using different formulae

Course Outcomes:

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

- Understand principal stresses and principal planes.
- Determine deflection at any point on a beam under simple and combined loads
- Analyze members under torsion, deformation in springs,
- Know the effect of eccentricity of load in columns, apply failure criteria to implement in design of structural members.
- Know the crippling load for the columns.

Text Books:

1. R.S.Khurmi and N.Khurmi, "Strength of Materials (Mechanics of Solids)", S Chand And Company Limited, Ramnagar, New Delhi-110 055
2. R. K. Bansal, "Strength of Materials", Laxmi Publications (P) Ltd., New Delhi.
3. B. S. Basavarajaiah and P. Mahadevappa, "Strength of Materials" 3rd Edition 2010, in SI UNITS, Universities Press Pvt Ltd, Hyderabad.
4. S.S. Bhavikatti, "Strength of Materials", Fourth edition, Vikas Publishing House, Pvt. Ltd.

References:

1. B. C. Punmia Strength of Materials by.- Laxmi publications.
2. D. S. Prakasa Rao Strength of Materials by, Universities Press Pvt Ltd, Hyderabad.
3. Schaum's outline series Strength of Materials, Mc Graw hill International Editions.
4. L.S. Srinath, Strength of Materials, Macmillan India Ltd., New Delhi.

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19A01402T

HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives:

- To Introduce concepts of laminar and turbulent flows
- To teach principles of uniform and non-uniform flows through open channel.
- To impart knowledge on design of turbines.
- To impart knowledge on design of pumps.

UNIT -I:

Laminar & Turbulent flow in pipes:

Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram – Introduction to boundary layer theory.

Unit Outcomes

- Understand Laminar Flow through plates
- Understand Turbulent flow and transition
- Apply energy and momentum principles to fluid flow situations
- Solve problems for forces in static and moving fluids

UNIT -II:

Uniform flow in Open Channels:

Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Computation of Uniform flow.

Unit Outcomes

- Differentiate open and closed channel flows
- Understand different formulae on open channel flow
- Design open-channel flow systems.

UNIT III:

Non-Uniform flow in Open Channels:

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Broad Crested Weir. Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

Unit Outcomes

- Understand the concepts of varying flow in pipes
- Measure discharge and velocity
- Understand gradually varied flow
- Solve introductory problems of forces and dynamics

UNIT -IV:

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - velocity triangles at inlet and outlet - Work done and efficiency

Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

Unit Outcomes

- Understand hydrodynamic force of jets different vanes
- Calculate efficiency of jets
- Understand and design Pelton wheel, Francis and Kaplan turbine

UNIT -V:

Pumps:

Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies – Introduction to Reciprocating Pump.

Unit Outcomes

- Understand principles of centrifugal pumps
- Calculate losses and efficiencies of centrifugal pumps
- Design centrifugal pumps including multi stage pumps.

Course Outcomes:

At the end of the course, the student will be able to

- Understand characteristics of laminar and turbulent flows.
- Analyze characteristics for uniform and non-uniform flows in open channels.
- Design different types of turbines
- Design centrifugal and multi stage pumps.

Text Books:

1. P. M. Modi and S. M. Seth, “Hydraulics and Fluid Mechanics”, Standard Book House
2. K. Subramanya, Open channel Flow, Tata McGraw Hill.

References:

1. Rajput, “Fluid Mechanics and Fluid Machines” , S. Chand & Co
2. D. S. Kumar, “Fluid Mechanics & Fluid Power Engineering”, Kataria & Sons.
3. Srinivasan, Open channel flow by, Oxford University Press
4. Banga & Sharma, “Hydraulic Machines”, Khanna Publishers.
5. S.C.Gupta, “Fluid Mechanics and Hydraulic Machines”, Pearson publications,

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19A01403 STRUCTURAL ANALYSIS-I

Course objectives:

- To impart knowledge on energy theorems.
- To enable the student analyze indeterminate trusses
- To make the student to understand the analysis procedures for analyzing fixed and Continuous beams.
- To enable the student to undergo analysis procedure using slope deflection method.
- To illustrate analysis procedure using moment distribution method.
- To demonstrate various methods of analysis of structural members such as indeterminate beams, frames, etc. which enables the student to solve for forces in various complex structural systems.

UNIT – I

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear force – Castigliano's first theorem - Deflections of simple beams and pin jointed trusses.

Unit Outcomes

- Understand Energy concepts
- Develop expression for strain energy due to axial load Bending moment and shear force
- Calculate deflections in simple beams and pin joined trusses
- Analyze simple structural elements using energy principles.

UNIT – II

Analysis of Indeterminate Structures: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses up to two degrees of internal and external indeterminacy – Castigliano's second theorem.

Unit Outcomes

- Differentiate determinate and indeterminate structures
- Understand static and kinematic indeterminacies
- Solve truss problems

UNIT – III

Fixed Beams & Continuous Beams : Introduction to statically indeterminate beams- theorem of three moments-uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – effect of sinking of support, effect of rotation of a support.

Unit Outcomes

- Categorize fixed and continuous beams and their performance
- Understand different loads on beams with different boundary conditions.
- Analyze the beams subjected to loads
- Study effect of sinking of supports of performance

UNIT – IV

Slope-Deflection Method: Introduction- derivation of slope deflection equation- application to continuous beams with and without settlement of supports- Analysis of single bay, single storey, portal frame including side sway.

Unit Outcomes

- Develop slope deflection expressions
- Analyze structures with and without support sinking
- Analyze 2D frames using slope-deflection method.

UNIT – V

Moment Distribution Method: Introduction to moment distribution method- application to continuous beams with and without settlement of supports. Analysis of single storey portal frames – including Sway.

Unit Outcomes

- Develop moment distribution expressions
- Analyze structures with and without support sinking
- Analyze single storey portal frames

Course Outcomes

At the end of the course student will be able to

- Apply energy theorems for analysis of indeterminate structures
- Analyze indeterminate structures with yielding of supports
- Analyze beams using slope deflection and moment distribution methods
- Analyze portal frames using slope deflection and moment distribution methods

Text Books:

1. S.S. Bhavikatti, “Structural Analysis”, Volume 1 and 2, Vikas Publishing House, Pvt. Ltd.
2. S. Ramamurtham, “Theory of Structures”, Dhanpat Rai Publishing Company (p) Ltd, 2009
3. C. S. Reddy, “Basic Structural Analysis”, Tata McGraw Hill

References:

1. Timoshenko & Young, “Theory of Structures”, Tata McGraw Hill
2. S. B. Junarkar, “Structural Mechanics” Vol I & II, Charotar Publishers
3. C. K. Wang, “Intermediate Structural Analysis”, McGraw Hill

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CONCRETE TECHNOLOGY

Course objectives:

- To explain the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
- To develop fundamental knowledge in the fresh and hardened properties of concrete
- To inculcate the testing methodology to evaluate the properties of concrete during fresh and hardened stage
- To impart the knowledge on the behavior of concrete with response to stresses developed.
- To impart the knowledge on the special concretes And design a concrete mix which fulfils the required properties for fresh and hardened concrete

UNIT – I:

Ingredients of concrete:

Cement-chemical composition-hydration process-Bogue's compound-Tests on properties of cement-Types of cement - I.S. Specifications. **Aggregates**- classification of aggregate – tests on properties of aggregates - characteristics of aggregate - I.S. Specifications. **Water**-quality of water - characteristics of water - I.S. Specifications. **Admixtures** – classification of chemical admixtures – properties and limitations – classification of mineral admixtures – properties and limitations - I.S. Specifications.

Unit Outcomes

- List different ingredients of concrete
- Conduct tests on materials
- Explain characteristics of water
- Understand conformity to IS Codes

UNIT – II:

Properties of concrete:

Fresh concrete: Mixing of concrete-workability-factors influencing workability- measurement of workability for conventional concrete (Slump Cone, Compaction Factor and Vee-Bee test) & SCC (V-Funnel, L-Box, U- Box, Slump Flow and J-Ring). **Hardened concrete:** Water/Cement Ratio(Abram's Law)-Gel Space Ratio-tests on hardened concrete-Destructive Tests (Compression, Split Tensile and Flexural)-Semi Destructive Tests (Core Cutter and Pull out test) and Non Destructive Tests (Rebound Hammer-UPV - Radiological methods) .

Unit Outcomes

- List various properties of fresh concrete
- Conduct experiments for determination of fresh concrete properties
- List various properties of hardened concrete
- Conduct experiments for determination of hardened concrete properties
- Carryout Non Destructive tests on Concrete

UNIT – III

Elasticity, Shrinkage and Creep:

Curing of concrete -methods of curing-effects of improper curing-self curing-Modulus of Elasticity-Poisson's Ratio-Dynamic Modulus of Elasticity- Shrinkage and various types -Factors Affecting Shrinkage-Moisture Movement-Creep of Concrete-Factors Influencing Creep.

Unit Outcomes

- Understand curing methods and its importance
- Understand phenomenon of shrinkage and creep of concrete.
- Evaluate factors influencing creep and concrete

UNIT – IV

Concrete Mix Design:

Proportioning of Concrete Mixes-factors influencing - Road Note. No. 4 and IS Code Methods- IS 456 provisions on Durability-Quality Control and Statistical Methods – Mix Design of High Strength concrete (using ACI method).

Unit Outcomes

- Study properties of concrete mixes
- Design concrete mixes using different methods
- Estimate quantities for target strength of concretes

UNIT – V

Special Concretes:

Light Weight Concretes –Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete-High Density Concrete – Fiber Reinforced Concrete-Polymer Concrete-Self Compacting Concrete and its Mix Design using EFNARC guidelines.

Unit Outcomes

- Label different types of special concretes with the objectives
- Understand properties of special concretes.

Course Outcomes:

At the end of the course student is able to

- Understand various ingredients of concrete and their role.
- Examine knowledge on the fresh and hardened properties of concrete.
- Design concrete mixes using various methods.
- Perceive special concretes for accomplishing performance levels.

Text Books:

1. A. M. Neville, “Properties of Concrete”, Pearson Publication – 4th Edition
2. M.S. Shetty, A. K. Jain, “Concrete Technology Theory and Practice”, S. Chand and Company Limited, New Delhi

References:

1. M. L. Gambhir, “Concrete Technology”, Tata Mc. Graw Hill Publishers, New Delhi
2. N. Krishna Raju, “Design of Concrete Mixes”, CBS Publishers.
3. P. K. Mehta And J. M. Monteiro, “Concrete: Micro Structure, Properties and Materials” Mc-Graw Hill Publishers
4. J. Prasad, C.G.K. Nair, “Non-Destructive Test and Evaluation of Materials”, Tata McGraw Hill Publishers, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A01405T TRANSPORTATION ENNGINEERING

Course Objectives:

- To impart knowledge on highway development.
- To teach concepts of Geometric design and alignment.
- To throw light on different traffic surveys.
- To teach design of highway intersections
- To impart knowledge on highway materials and design of pavements

UNIT -I

Highway development and planning:

Highway development in India – Necessity for Highway Planning- Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment and Influencing Factors - Engineering Surveys.

Unit Outcomes:

- Understand importance of highway development
- Classify highways based on hierarchy.

UNIT -II

Highway Geometric Design:

Geometric Design- Design Criteria- Cross Section Elements- Sight Distances - Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

Unit Outcomes

- Understand different aspects governing highway geometric design.
- Design vertical and horizontal alignment of highways

UNIT -III

Traffic Engineering and Regulation:

Basic Parameters - Traffic Volume Studies- Data Collection and Presentation-Speed Studies- Data Collection and Presentation- Parking Studies and Characteristics- Road Accidents-Causes and Preventive Measures- Accident Data Recording – Condition Diagram and Collision Diagrams - Road Traffic Signs – Road markings.

Unit Outcomes

- Identify need and methods of Traffic Surveys.
- Understand importance of parking and related surveys.
- Understand the role of engineering in road safety.

UNIT -IV

Intersection design:

Conflicts at Intersections- Types of Intersections – Channelization –Traffic Islands and Design At- grade intersections and Grade separated intersections- Rotary Intersection and Design elements.

Unit Outcomes

- Understand the objectives of channelization.
- Understand the types of intersections and their design features.

UNIT – V

Highway materials and Pavement design:

Highway materials – Road aggregates-desirable properties-tests on road aggregates. Bituminous materials – tests on bituminous materials. Flexible and Rigid Pavements – Components and Functions – design of Flexible pavement (G.I method and CBR Method as per IRC 37) –Design of Rigid pavements – Westergaard's stress equations – CC pavements design-stresses in pavements.

Unit Outcomes

- Understanding the suitability of highway materials and tests on them
- Understand the types of pavements and their structural properties.
- Design of rigid and flexible pavements.

Course Outcomes:

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

- Understand the importance of highways in economic development of nation.
- Understand the history of road development in India and various road development plans.
- Identify the highway materials and tests related to them.
- Design horizontal and vertical alignment aspects.
- Understand the surveys required for highway planning and design.
- Differentiate between types of pavements and their design features.

Text Books:

1. S. K. Khanna and C. E. G. Justo, “Highway Engineering”, Nemchand & Bros., 7th edition (2000).
2. C.Venkataramaiah, “Transportation Engineering” (Vol – I), Universities Press Pvt Ltd, Hyderabad.

References:

1. L. R. Kadiyali and Lal, “Principles and Practice of Highway Engineering Design”, Khanna Publications.
2. R. Srinivasa Kumar, “Highway Engineering”, Universities Press Pvt Ltd, Hyderabad. 2011.
3. S K Sharma, “ Highway Engineering”, S. Chand and Company Limited, New Delhi
4. *S P Chandola*, “*Transportation Engineering*”, S. Chand and Company Limited, New Delhi

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B.Tech – II-II Sem

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19A01406 ENVIRONMENTAL ENGINEERING

Course Objectives:

- To teach requirements of water and its treatment.
- To impart knowledge on sewage treatment methodologies.
- To provide facts on Air pollution and control.
- To enable with design concepts of wastewater treatment UNITS
- To throw light on importance of plumbing.

UNIT I:

Water quality and treatment:

Water quality: Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design.

Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes

Unit Outcomes

- Understand importance of water quality
- Explain water quality standards
- Plan water supply systems in terms of transmission and distribution
- Categorize different water treatment procedures

UNIT II:

Sewage and Treatment:

Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment – COD &

BOD- aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Unit Outcomes

- Distinguish characteristics of domestic and storm water
- Plan Sewage treatment and disposal methodologies
- Assess quality of waste water parameters
- Design waste water treatment systems leading to cleaning of rivers

UNIT III:

Air Pollution;

Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations.

Unit Outcomes

- Identify causes and types of air pollution
- Understand occupational hazards due to different pollutions
- Assess air quality parameters
- Design methodologies to control air pollution

UNIT IV:

Solid Waste Management-

Municipal solid waste-Composition - chemical and physical parameters - Collection, transport, treatment and disposal. waste from commercial establishments and other urban zones- construction activities - biomedical wastes, Effects of solid waste on environment. Disposal of solid waste- Disposal methods- Integrated solid waste management.

Unit Outcomes

- Segregate different types of municipal wastes
- Understand stages of handling municipals solid wastes
- Sewage treatment and disposal methodologies
- Design solid waste disposal leading to integrated solid waste management

UNIT V:

Domestic Plumbing

Types of home plumbing systems for water supply and waste water disposal, high rise building plumbing-Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings. Role of Government authorities in water supply, sewerage disposal.

Unit Outcomes

- Understand the importance of plumbing.
- Explain different plumbing techniques

Course Outcomes:

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

- Understand about quality of water and purification process
- Select appropriate technique for treatment of waste water.
- Assess the impact of air pollution
- Understand consequences of solid waste and its management.
- Design domestic plumbing systems.

Text Books:

1. G. S. Birdi, “Water supply and sanitary Engineering”, Dhanpat Rai & Sons Publishers.
2. Peavy, H.S, Rowe, D. R. Tchobanoglous, “Environmental Engineering”, Mc-Graw – Hill International Editions, New York 1985.

References:

1. B.C. Punmia, Ashok Jain & Arun Jain, “Water Supply Engineering”, Vol. 1, Waste water Engineering, Vol. II, Laxmi Publications Pvt. Ltd, New Delhi.
2. MetCalf and Eddy, “Wastewater Engineering”, Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
3. S. M. Patil, “Plumbing Engineering Theory, Design and Practice”, 1999.
4. K. N. Duggal, ”Elements of Environmental Engineering”, S. Chand Publishers.

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19A01402P

HYDRAULIC MACHINERY LAB

Course Objectives:

The object of the course is to make the students understand the working principles of vanes under impact of water jets, various turbines and pumps

Laboratory Experiments:

- Impact of jet on vanes
- Study of Hydraulic jump.
- Performance test on Pelton wheel turbine
- Performance test on Francis turbine.
- Efficiency test on centrifugal pump.
- Efficiency test on reciprocating pump.
- Efficiency test on multi stage centrifugal pump.
- Head loss due to bend
- Experiment on turbine flow meter (water meter)
- Partial flume experiment.
- Flow transitions – flow over hump above ground in open channel.
- Flow transitions – flow over hump below (Depression) ground in open channel.

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the performance of various hydraulic machinery and flow characteristics.

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19A01405P TRANSPORTATION ENGINEERING LAB

Course Objectives:

The object of the course is to enable the students to identify the physical characteristics of aggregates and bitumen.

Laboratory Experiments:

Road Aggregates:

- Aggregate Crushing value Test.
- Aggregate Impact Test.
- Abrasion Test.
- Shape tests
- II. BITUMINOUS MATERIALS:
- Penetration Test.
- Ductility Test.
- Softening Point Test.
- Flash and fire point tests.

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the physical characteristics of aggregates and bitumen

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19A99302

BIOLOGY FOR ENGINEERS

Course Objectives: To provide basic understanding about life and life Process. Animal and plant systems. To understand what biomolecules are, their structures and functions. Application of certain biomolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units, i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

Unit I: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L2)
- Understand how organisms are classified. (L3)

Unit II: Introduction to Biomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? their role in living cells, their structure, function and how they are produced. (L1)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L3)
- Understand what is fermentation and its applications of fermentation in industry. (L4)

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes (L1)
- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

Unit V: Application of Biology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.(L1)
- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.

Text books:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications -
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014