

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**Course Structure and syllabi for**  
**M.Tech-CIVIL COMPUTER AIDED STRUCTURAL ENGINEERING**  
**for affiliated Engineering Colleges 2017-18**

**I YEAR I Semester**

S. No	Course Code	Subject	L	T	P	C
1.	17D35101	Computer Aided Numerical Methods	4	---	---	4
2.	17D20102	Advanced Structural Analysis	4	---	---	4
3.	17D20103	Theory Of Elasticity And Plasticity	4	---	---	4
4.	17D35102	C++ and Data Structures	4	---	---	4
5.		Elective – I	4	---	---	4
	17D20105	1. Experimental Stress Analysis				
	17D35103	2. Optimization in Structural Design				
	17D35104	3. Structural Health Monitoring				
6.		Elective – II	4	---	---	4
	17D35105	1. Modeling, Simulation and Computer Applications				
	17D20108	2. Prestressed Concrete				
	17D20203	3. Stability of Structures				
7.	17D35106	CAD Laboratory I	--	---	4	2
		<b>Total</b>	<b>24</b>		<b>4</b>	<b>26</b>

**I YEAR II Semester**

S. No	Course Code	Subject	L	T	P	C
1.	17D20201	Structural Dynamics	4	---	---	4
2.	17D20202	Finite Element Methods	4	---	---	4
3.	17D35201	Artificial Neural Networks	4	---	---	4
4.	17D35202	CAD and Computer Applications in Structural Engineering	4	---	---	4
5.		Elective – III	4	---	---	4
	17D20204	1. Analysis of Shells and Folded Plates				
	17D35203	2. Reliability Based Engineering Design				
	17D20207	3. Earthquake Resistant Structures				
6.		Elective – IV	4	---	---	4
	17D35204	1. Management Information Systems				
	17D20210	2. Fracture Mechanics				
	17D20106	3. Advanced Concrete Technology				
7.	17D35205	CAD Laboratory II	--	---	4	2
		<b>Total</b>	<b>24</b>		<b>4</b>	<b>26</b>

**M.Tech. II YEAR (III Semester)**

S. No	Course Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective – V ( Open Elective) 1. Research Methodology 2. Human Values & Professional Ethics 3. Intellectual Property Rights	4	---	---	4
2.	17D35301	ELECTIVE – VI ( MOOCs)	--	---	---	--
3.	17D35302	Comprehensive Viva Voce	--	---	---	2
4.	17D35303	Seminar	--	---	---	2
5.	17D35304	Teaching Assignment	--	---	---	2
6.	17D35305	Project Work Phase I	--	---	---	4
	<b>Total</b>		<b>4</b>			<b>14</b>

**M.Tech. II YEAR (IV Semester)**

S. No	Course Code	Subject	L	T	P	C
1.	17D35401	Project Work Phase II	--	---	---	12
	<b>Total</b>					<b>12</b>

**Project Viva Voce Grades:**
**A: Satisfactory**
**B: Not Satisfactory**

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**M.Tech I semester (CASE)**

L	T	P	C
4	0	0	4

**(17D35101) COMPUTER AIDED NUMERICAL METHODS**

**Unit-I**

Solution Of Non-Linear Equations: Newton-Raphson Method, Von-Mises Formula, Chord's Method, Bisection Method- Comparative Study-Solution Of Cubic Equation And Quartic Equation.

Numerical Integration: Newton-Cotes Integration Formulas- Trapezoidal Rule-Romberg Integration – Simpson's Rule – Gaussian Quadrature – Errors In Integration Formulas – Multiple Integration With Variable Limits.

**Unit-Ii**

Solution Of System Of Equations: Gauss Elimination Method- Gauss-Jordan Method- L-U Decomposition – Errors In The Solution- Iterative Methods – Solution Of Sets Of Non Linear Equations.

Boundary Value Problems And Characteristics – Value Problems: Shooting Method- Solution Through A Set Of Equations – Derivative Boundary Conditions – Characteristic Value Problems – Eigen Values Of Matrix By Iteration.

**Unit-Iii**

Numerical Solution Of Elliptical Partial Differential Equations: Equilibrium Temperatures In A Heated Slab-Equation Of Steady State Heat Flow – Laplace Equation On Rectangular Region – Poisson Equation –Derivative Boundary Conditions.

**Unit-Iv**

Numerical Solution Of Parabolic Partial Differential Equations: Explicit Method- Simple Implicit Method Crank- Nicolson Method- Derivative Boundary Conditions – Stability And Convergence Criteria - Equations In Two Dimensions.

**Unit-V**

Finite Element Method: General Approach – Finite Element Application In One Dimension And 2-D Problems.

**Text / Reference Books:**

1. Numerical Methods For Engineers By Steven C.Chapra And Raymond P.Canal – Mc Graw Hill Book Company.
2. Applied Numerical Analysis By Curtis .F.Gerald-Addition-Wesley Publishing Company.
3. C Language And Numerical Methods By C.Xavier-New Age International Publishers

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4	0	0	4

**(17D20102) ADVANCED STRUCTURAL ANALYSIS**

1. **INTRODUCTION:-**Indeterminacy-Determination Of Static And Kinematic Indeterminacies Of Two-Dimensional And Three-Dimensional Portal Frames, Pin Jointed Trusses And Hybrid Frames-Coordinate Systems –Structural Idealization. Introduction To Matrix Methods Of Analysis-Flexibility And Stiffness Matrices-Force Displacement Relationships For Axial Force, Couple, Torsional Moments – Stiffness Method Of Analysis And Flexibility Method Of Analysis.
2. **ANALYSIS OF CONTINUOUS BEAMS-** Stiffness Method And Flexibility Method Of Analysis –Continuous Beams Of Two And Three Spans With Different End Conditions-Internal Hinges.
3. **ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES & PIN JOINTED TRUSSES** – Stiffness And Flexibility Method Of Analysis Of 2D Portal Frames With Different End Conditions-Plotting Of Bending Moment Diagrams. Computation Of Joint Displacement And Member Forces For Pin jointed Trusses.
4. **TRANSFORMATION OF CO-ORDINATES** - Local And Global Co-Ordinate Systems-Transformation Of Matrices From Local To Global Coordinates Of Element Stiffness Matrix-Direct Stiffness Method Of Analysis-Assembly Of Global Stiffness Matrix From Element Stiffness Matrices –Static Condensation-Sub-Structuring.
5. **EQUATION SOLVERS**-Solution Of System Of Linear Algebraic Equations-Direct Inversion Method-Gauss Elimination Method-Cholesky Method-Banded Equation Solvers-Frontal Solution Technique.

**TEXT/REFERENCE BOOKS :**

1. Structural Analysis By Pundit & Gupta, Tata MC Graw Hill Book Company.
2. Structural Analysis By C.S.Reddy, Tata MC Graw Hill Book Company
3. Cotes, R.C., Couties, M.G., And Kong, F.K., Structural Analysis, ELBS.
4. MC.Guire, W.,And Gallagher, R.H., Matrix Structural Analysis, John Wiley And Sons.

5. John L.Meek., Matrix Strucstural Analysis, MC Graw Hill Book Company.
6. Structural Analysis – R.C.Hibbeler, Pearson Education

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**L T P C**  
**4 0 0 4**

**(17D20103) THEORY OF ELASTICITY AND PLASTICITY**

- 1. INTRODUCTION TO PLANE STRESS AND PLANE STRAIN ANALYSIS:**  
 Elasticity –Notation For Forces And Stresses-Components Of Stresses – Components Of Strain –Hooke's Law. Plane Stress-Plane Strain-Differential Equations Of Equilibrium- Boundary Conditions- Compatibility Equations-Stress Function-Boundary Conditions.
- 2. TWO DIMENSIONAL PROBLEMS IN RECTANGULAR COORDINATES:**  
 Solution By Polynomials-Saint Venant's Principle-Determination Of Displacements-Bending Of Simple Beams-Application Of Fourier Series For Two Dimensional Problems - Gravity Loading.
- 3. TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES :**  
 General Equation In Polar Co-Ordinates - Stress Distribution Symmetrical About An Axis –Pure Bending Of Curved Bars- Strain Components In Polar Coordinates-Displacements For Symmetrical Stress Distributions-Simple Symmetric And Asymmetric Problems-General Solution Of Two Dimensional Problem In Polar Coordinates-Application Of The General Solution Of Two Dimensional Problem In Polar Coordinates-Application Of The General Solution In Polar Coordinates.
- 4. ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS:** Principle Stress - Ellipsoid And Stress-Director Surface-Determination Of Principle Stresses- Maximum Shear Stresses-Homogeneous Deformation-Principle Axis Of Strain Rotation. **General Theorems:** Balance Laws - Differential Equations Of Equilibrium- Conditions Of Compatibility - Determination Of Displacement-Equations Of Equilibrium In Terms Of Displacements-Principle Of Superposition-Uniqueness Of Solution –The Reciprocal Theorem.
- 5. TORSION OF PRISMATICAL BARS:**  
 Torsion Of Prismatic Bars- Elliptical Cross Section-Other Elementary Solutions-Membrane Analogy-Torsion Of Rectangular Bars-Solution Of Torsional Problems By Energy Method-Use Of Soap Films In Solving Torsional Problems-Hydra Dynamical Analogies-Torsion Of Shafts, Tubes, Bars Etc.

**TEXT/REFERENCE BOOKS :**

1. Theory of Elasticity and Plasticity by Timoshenko, S., MC Graw Hill Book company.
2. Advanced Strength of materials by Papoov, MC Graw Hill Book company.
3. Theory of Elasticity and Plasticity by Sadhu Singh. Khanna Publishers.
4. Chen, W.F. and Han, D.J. Plasticity for structural Engineers, Springer – Verlag, New York.
5. Lubliner, J., Plasticity theory, Mac Millan Publishing Co., New York.
6. Foundations of Solid Mechanics by Y.C.Fung, PHI Publications.
7. Advanced Mechanics of Solids by L.S. Srinath, Tata MC Graw Hill Book company.

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**(17D35102) C++ AND DATA STRUCTURES**

**Unit I :**

Object Oriented Programming :- Procedure – Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts Of Oop, Benefits Of Opp. Basics Of C++, Key Words, Data Types, Operators, Functions In C++, Classes And Objects.

Concepts Of C++:- Constructors, Parameterized Constructors, Copy Constructor, Destructors, Inheritance – Single, Multilevel, Multiple, Hierarchical, Hybrid, Parameter Passing Methods.

**Unit II :**

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort , Radix Sort. Searching: Binary Search, Linear Search.

**Unit III :**

Linked Lists :- Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked, Insertion In To And Deletion From Linked List.

**Unit IV :**

Stacks:- Introduction, Implementation Using Arrays And Linked Lists, Applications: Arithmetic Expression, Implementation Of Recursion, Towers Of Hanoi.

Queues: Introduction, Implementation Using Arrays And Linked Lists, Types Of Queues, Applications

**Unit V :**

Trees :- Binary Trees, Representing Binary Trees In Memory, Operations On Binary Trees, Types Of Trees.

**TEXT BOOKS :**

1. Object Oriented Programming With C++, “Balaguru Swamy”, Tata Mcgraw Hill.
2. Classic Data Structures, “D. Samantha”, PHI Learning Pvt. Ltd..
3. Data Structures, Algorithms And Applications In C++, S. Sahni, University Press (India) Pvt.Ltd, 2nd Edition, Universities Press.

**REFERENCES :**

1. Data Structures And Algorithms In C++, Michael T.Goodrich, R.Tamassia And Mount, Wiley Student Edition, John Wiley And Sons.
2. Data Structures And Algorithm Analysis In C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data Structures And Algorithms In C++, 3rd Edition, Adam Drozdek, Thomson
4. Data Structures Using C And C++, Langsam, Augenstein And Tanenbaum, PHI.
5. Problem Solving With C++, The OOP, Fourth Edition, W.Savitch, Pearson Education.
6. Data Structures Using C++, D.S. Malik, Cengage Learning, India Edition.

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**L T P C**  
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**(17D20105) EXPERIMENTAL STRESS ANALYSIS**  
**ELECTIVE-I**

**1. PRINCIPLES OF EXPERIMENTAL APPROACH :-**

Merits Of Experimental Analysis Introduction, Uses Of Experimental Stress Analysis Advantages Of Experimental Stress Analysis, Different Methods –Simplification Of Problems.

**2. STRAIN MEASUREMENT USING STRAIN GAUGES :-**

Definition Of Strain And Its Relation Of Experimental Determinations Properties Of Strain-Gauge Systems-Types Of Strain Gauges –Mechanical, Acoustic And Optical Strain Gauges. Introduction To Electrical Strain Gauges - Inductance Strain Gauges – LVDT – Resistance Strain Gauges – Various Types –Gauge Factor – Materials Of Adhesion Base..

**3. STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:-**Introduction – The Three Elements Rectangular Rosette – The Delta Rosette Corrections For Transverse Strain Gauge. Ultrasonic Pulse Velocity Method – Application To Concrete. Hammer Test – Application To Concrete.

**4. THEORY OF PHOTOELASTICITY :-**

Introduction –Temporary Double Refraction – The Stress Optic Law –Effects Of Stressed Model In A Polariscope For Various Arrangements – Fringe Sharpening. Brewster's Stress Optic Law.

**5. TWO DIMENSIONAL PHOTOELASTICITY :-**

Introduction – Isochromatic Fringe Patterns- Isoclinic Fringe Patterns Passage Of Light Through Plane Polariscope And Circular Polariscope Isoclinic Fringe Patterns – Compensation Techniques – Calibration Methods – Separation Methods – Scaling Model To Prototype Stresses – Materials For Photoelasticity- Properties Of Photoelastic Materials.

**Reference Books :-**

- 1.Experimental Stress Analysis By J.W.Dally And W.F.Riley, College House Enterprises
2. Experimental Stress Analysis By Dr.Sadhu Singh.Khanna Publishers
- 3.Experimental Stress Analysis By U.C.Jindal, Pearson Publications.
4. Experimental Stress Analysis By L.S.Srinath, MC.Graw Hill Company Publishers

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**M.Tech I semester (CASE)**

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4	0	0	4

**(17D35103) OPTIMIZATION IN STRUCTURAL DESIGN**  
**ELECTIVE-I**

1. System Approach – Techniques Of Operation Research – Decision Making – Research Models. Basic Concepts Of Minimum Weight, Minimum Cost Design, Variables, Constrains, Model And Model Building, Objective Function, Classical Methods.
2. Concept Of Liner Programming, Integer Programming, Quadratic Programming, Dynamic Programming And Geometric Programming Methods For Optimal Design Of Structural Elements. Linear Programming: Standard Form Of Linear Programming Problem, Geometry Of Linear Programming Problem. Solution Of System Of Linear Simultaneous Equations. Application Of Linear Programming Methods For Plastic Design Of Frames Computer Search Methods Of Univariate And Multivariate Minimization.
3. Simplex Method. – Revised Simplex Method, Duality Of Linear Programming Sensitivity Or Post Optimality Analysis.
4. Optimization By Structural Theorems. Maxwell Mitchell And Heymans Theorem For Structures And Frames.
5. Optimization Techniques Applied To Fully Stressed Design With Deflection Constraints, Optimality Criterion Methods.

**TEXT / REFERENCE BOOKS:**

1. Spunt, Optimum Structural Design, Civil Engineering And Engineering Mechanics Services, Prentice Hall New Jersey, 1971.
2. S.S.Rao, Optimization Theory And Applications, Wiley Eastern Limited, New Delhi, 1977.
3. Uri Krisch, Optimum Structural Design Mc Graw Hill Book Co., 1981.
4. Richard Bronson, Operations Research, Schaums, Outline Series, Mc Graw Hill Book Company, Singapore 1983.

5. J.S.Arora, Introduction To Optimum Design, Mc Graw Hill Book Company, New Your, 1989.
6. A.J. Morris (Editor) Foundations Of Structural Optimization – A Unified Approach, John Wiley And Sons, Chichester, 1982.

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**(17D35104) STRUCTURAL HEALTH MONITORING**  
**(ELECTIVE I)**

**UNIT I**

**Introduction To Structural Health Monitoring (SHM) :**

Definition & Motivation For SHM, SHM - A Way For Smart Materials And Structures, SHM And Bio Mimetic - Analog Between The Nervous System Of A Man And A Structure With SHM;

SHM As A Part Of System Management, Passive And Active SHM, NDE, SHM And NDECS, Basic Components Of SHM, Materials For Sensor Design.

**UNIT II**

**Application Of SHM In Civil Engineering:** Introduction To Capacitive Methods, Capacitive Probe For Cover Concrete, SHM Of A Bridge, Applications For External Post Tensioned Cables, Monitoring Historical Buildings.

**UNIT III**

**Non Destructive Testing Of Concrete Structures:** Introduction To NDT - Situations And Contexts, Where NDT Is Needed, Classification Of NDT Procedures, Visual Inspection, Half-Cell Electrical Potential Methods, Schmidt Rebound Hammer Test, Resistivity Measurement, Electromagnetic Methods, Radiographic Testing, Ultrasonic Testing, Infra Red Thermography, Ground Penetrating Radar, Radio Isotope Gauges, Other Methods.

**UNIT IV**

**Condition Survey & NDE Of Concrete Structure:**

- Definition And Objective Of Condition Survey, Stages Of Condition Survey (Preliminary, Planning, Inspection And Testing Stages)
- Possible Defects In Concrete Structures, Quality Control Of Concrete Structures - Definition And Need, Quality Control Applications In Concrete Structures, NDT As An Option For Non-Destructive Evaluation (NDE) Of Concrete Structures, Case Studies Of A Few NDT Procedures On Concrete Structures.

## UNIT V

### Rehabilitation And Retrofitting Of Concrete Structure :

- a) Repair Rehabilitation & Retrofitting Of Structures, Damage Assessment Of Concrete Structures, Materials And Methods For Repairs And Rehabilitation.
- b) Modeling Of Repaired Composite Structure, Structural Analysis And Design - Importance Of re-Analysis, Execution Of Rehabilitation Strategy, Case Studies.

### Reference Books:

1. Daniel Balageas, Claus - Peter Fritzenami Alfredo Guemes, Structural Health Monitoring, Published By Iste Ltd., U.K. 2006.
2. Guide Book On Non-Destructive Testing Of Concrete Structures, Training Course Series No.17, International Atomic Energy Agency, Vienna, 2002.
3. Hand Book On "Repair And Rehabilitation Of Rcc Buildings", Published By Director General, Cpwd, Govt. Of India, 2002.
4. Hand Book On Seismic Retrofitting Of Buildings, Published By Cpwd & Indian Building Congress In Association With Iit, Madras, Narosa Publishing House, 2008

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**M.Tech I semester (CASE)**

**L T P C**  
**4 0 0 4**

**(17D35105) MODELLING, SIMULATION AND COMPUTER APPLICATIONS**  
**(ELECTIVE – II)**

- 1. System Models:** Concepts, Continues And Discrete Systems, System Modeling, Types Of Models, Subsystems, Corporate Model, And System Study.

**System Simulation:** Techniques, Comparison Of Simulation And Analytical Methods, Types Of Simulation, Distributed Log Models, Cobweb Models.

- 2. Continuous System Simulation:** Numeric Solution Of Differential Equations, Analog Computers, Hybrid Computers, Continuous System Simulation Languages CSMP, System Dynamic Growth Models, Logistic Curves.

- 3. Probability Concepts In Simulation:** Monte-Carlo Techniques, Stochastic Variables, Probability Functions, Random Number Generation Algorithms.

- 4. Queuing Theory:** Arrival Pattern Distributions, Servicing Times, Queuing Disciplines, Measure Of Queues, Mathematical Solutions To Queuing Problems.

**Discrete System Simulation:** Events, Generation Of Arrival Patterns, Simulation Programming Tasks, Analysis Of Simulation Output.

- 5. GPSS & SIMSCRIPT, Programming In GPSS:** Simulation Programming Techniques: Data Structures, Implementation Of Activities, Events And Queues, Event Scanning, Simulation Algorithms In GPSS And SIMSCRIPT.

**TEXT/ REFERENCE BOOKS:**

1. Geoffery Gordon: System Simulation, PHI.
2. Naylor, Thomas, H. Computer Simulation Experiments With Models Of Economic Systems, John Wiley And Sons, 1971.
3. Naylor Thomas, H And ET. AI. Computer Simulation Techniques, John Wiley And Sons, 1966.
4. Louis Wdward Alfeld And Alan K.Graham, Introduction To Urban Dynamics, Wright – Allen Press Inc., Massachusetts, 1976.
5. Richard J.Chorley And Peter Haggett, Models In Geography, Methuen & Co.Ltd., 1977.



6. Hamdy A.Taha, Operations Research – An Introduction, Macmillan Company, New York, 1987.
7. Thirumurthy.A.M. Environmental Facilities And Urban Development In India-A System Dynamic Model For Developing Countries, Academic Foundations, India.

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**M.Tech I semester (CASE)**

**L T P C**  
**4 0 0 4**

**(17D20108) PRESTRESSED CONCRETE**  
**ELECTIVE - II**

- 1. INTRODUCTION:** Development Of Prestressed Concrete –Advantages And Disadvantages Of PSC Over RCC –General Principles Of Pre-Stressing-Pre Tensioning And Post Tensioning –Materials Used In PSC-High Strength Concrete –High Tension Steel-Different Types /Methods/Systems Of Prestressing.
- 2. Losses Of Prestress:** Estimation Of The Loss Of Prestress Due To Various Causes Like Elastic Shortening Of Concrete ,Creep Of Concrete, Shrinkage Of Concrete, Relaxation Of Steel, Slip In Anchorage, Friction Etc.
- 3. Flexure & Deflections:** Analysis Of Sections For Flexure In Accordance With Elastic Theory-Allowable Stresses-Design Criteria As Per I.S Code Of Practice – Elastic Design Of Beams (Rectangular, I And T Sections) For Flexure – Introduction To Partial Prestressing. Introduction-Factors Influencing Deflections-Short Term And Long Term Deflections Of Un-cracked And Cracked Members.
- 4. Shear, Bond, Bearing And Anchorage:** Shear In PSC Beams –Principal Stresses –Conventional Elastic Design For Shear-Transfer Of Prestress In Pre-tensioned Members-Transmission Length –Bond Stresses-Bearing At Anchorage – Anchorage Zone Stresses In Post-Tensioned Members-Analysis And Design Of End Blocks By Guyon, Magnel And Approximate Methods –Anchorage Zone Reinforcements.
- 5. Statistically Indeterminate Structures:** Introduction –Advantages And Disadvantages Of Continuity –Layouts For Continuous Beams-Primary And Secondary Moments –Elastic Analysis Of Continuous Beams-Linear Transformation-Concordant Cable Profile-Design Of Continuous Beams.

**REFERENCE BOOKS:**

1. Prestressed Concrete By S. Krishna Raju, TMH Pablishers.
2. Prestressed Concrete By S. Ramamrutham, Dhanpati Rai Pubilicartions.
3. Prestressed Concrete Design By Praveen Nagarajan, Pearson Publications.
4. T.Y.Lin, Design Of Prestressed Concrete Structures, Asian Publishing House, Bombay, 1953.
5. Y.Guyon, Prestressed Concrete, Vol.I&II, Wiley And Sons, 1960.
6. F.Leohhardt, Prestressed Concrete Design And Construction, Wilhelm Ernst And Shon, Berlin, 1964.
7. C.E.Reynolds and J.C. Steedman, Reinforced concrete designers hand bood, A view point publication, 1989.
8. Edward P.Nawy, Prentice Hall – Prestressed Concrete.
9. Prestressed Concrete – by Raj Gopal, Narsoa Publications.

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**M.Tech I semester (CASE)**

L	T	P	C
4	0	0	4

**(17D20203) STABILITY OF STRUCTURES**  
**(Elective - II)**

- 1. Formulations Related To Beam Columns :** Concept Of Stability, Differential Equation For Beam Columns –Beam Column With Concentrated Loads – Continuous Lateral Load –Couples -Beam Column With Built In Ends – Continuous Beams With Axial Load –Application Of Trigonometric Series – Determination Of Allowable Stresses.
- 2. Elastic Buckling Of Bars:** Elastic Buckling Of Straight Columns –Effect Of Shear Stress On Buckling-Eccentrically And Laterally Loaded Columns –Energy Methods –Buckling Of A Bar On Elastic Foundation, Buckling Of A Bar With Intermediate Compressive Forces And Distributed Axial Loads –Buckling Of Bars With Change In Cross Section –Effect Of Shear Force On Critical Load –Built Up Columns
- 3. Inelastic Buckling And Torsional Buckling :** Buckling Of Straight Bars-Double Modulus Theory –Tangent Modulus Theory. Pure Torsion Of Thin Walled Bar Of Open Cross Section-Non –Uniform Torsion Of Thin Walled Bars Of Open Cross Section-Torsional Buckling –Buckling Under Torsion And Flexure.
- 4. Mathematical Treatment Of Stability Problems:** Buckling Problem Orthogonality Relation –Ritz Method-Timoshenko Method, Galerkin Method
- 5. Lateral Buckling Of Simply Supported Beams And Rectangular Plates :** Beams Of Rectangular Cross Section Subjected For Pure Bending. Derivation Of Equation Of Rectangular Plate Subjected To Constant Compression In Two Directions And One Direction.

**REFERENCE BOOKS:**

1. Stability Of Metallic Structure By Bleich –Mc Graw Hill
2. Theory Of Beam Columns Vol I By Chen & Atsuta Mc.Graw Hill
3. Smitzes,Elastic Stability Of Structures, Prentice Hall,1973.
4. Timoshenko, S., And Gere., Theory Of Elastic Stability, Mc Graw Hill Book Company, 1973.

5. Brush And Almorth., Buckling Of Bars Plates And Shells, Mc Graw Hill Book Company ,1975.
6. Chajes, A., Principles Of Structural Stability Theory, Prentice Hall,1974
7. Ashwini Kumar, Stability Theory Of Structures, TATA Mc Graw Hill Publishing Company Ltd, New Delhi,1985.

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**(17D35106) CAD LABORATORY I**

L	T	P	C
0	0	4	2

1. Simple Programs: Prime Number, Factorial Of A Number, Conversion Of Integers Into Words, Swapping Of Two Integers, Addition And Multiplication Of Matrices.
2. Functions : Inline Functions, Functions With Parameters
3. Objects : Objects With Arrays, Counting Of Votes
4. Analysis Of Cantilever, Simply Supported Beam, Fixed Beams, Continuous Beams For Different Loading Conditions.
5. Design Of R.C.C. Beams, Slabs, Foundations.
6. Design Of Steel Tension Members.

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**L T P C**  
**4 0 0 4**

**(17D20201) STRUCTURAL DYNAMICS**

- 1. Theory Of Vibrations:** Introduction –Elements Of A Vibratory System – Degrees Of Freedom-Continuous Systems –Lumped Mass Idealization –Oscillatory Motion –Simple Harmonic Motion –Pictorial Representation Of S.H.M - Free Vibrations Of Single Degree Of Freedom (SDOF) Systems –Undamped And Damped – Critical Damping –Logarithmic Decrement –Forced Vibrations Of SDOF Systems-Harmonic Excitation –Dynamic Magnification Factor-Bandwidth.Fundamental Objective Of Dynamic Analysis-Types Of Prescribed Loading- Methods Of Discretization- Formulation Of The Equations Of Motion.
- 2. Single Degree Of Freedom System:** Formulation And Solutions Of The Equation Of Motion - Free Vibration Response –Response To Harmonic, Periodic, Impulsive And General Dynamic Loading –Duhamel Integral
- 3. Multi Degree Of Freedom System:** Selection Of The Degree Of Freedom – Evaluation Of Structural Property Matrices-Formulation Of The MDOF Equations Of Motion –Undamped Free Vibrations-Solution Of Eigen Value Problem For Natural Frequencies And Mode Shapes- Analysis Of Dynamic Response –Normal Coordinates –Uncoupled Equations Of Motion –Orthogonal Properties Of Normal Modes-Mode Superposition Procedure
- 4. Practical Vibration Analysis:** Stodola Method- Fundamental Mode Analysis – Analysis Of Second And Higher Modes –Holzer's Method –Basic Procedure – Transfer Matrix Procedure
- 5. Introduction To Earthquake Analysis:** Introduction –Excitation By Rigid Base Translation –Lumped Mass Approach -SDOF And MDOF System- I.S Code Methods Of Analysis.**Continuous System:** Introduction –Flexural Vibrations Of Beams- Elementary Case-Equation Of Motion –Analysis Of Undamped Free Shapes Of Simple Beams With Different End Conditions-Principles Of Application To Continuous Beams.

**REFERENCE BOOKS:**

- A.K.Chopra, “Structural Dynamics For Earthquake Engineering”, Pearson Publications
- Dynamics Of Structures By Clough & Penziem
- Structural Dynamics By Mario Paz
- I.S:1893(Latest)“ Code Of Practice For Earthquakes Resistant Design Of Stuctures”
- Anderson R.A Fundamentals Of Vibration, Amerind Pulblishing Co.,1972.

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**(17D20202) FINITE ELEMENT METHODS**

- 1. Introduction-**Concepts Of FEM –Steps Involved –Merits &Demerits –Energy Principles –Discretization –Rayleigh –Ritz Method Of Functional Approximation. **Elastic Formulations:** Stress Equations-Strain Displacement Relationships In Matrix Form-Plane Stress, Plane Strain And Axi-Symmetric Bodies Of Revolution With Axi Symmetric Loading
- 2. One Dimensional FEM-**Stiffness Matrix For Beam And Bar Elements Shape Functions For ID Elements –Static Condensation Of Global Stiffness Matrix- Solution –Initial Strain And Temperature Effects.
- 3. Two Dimensional FEM-**Different Types Of Elements For Plane Stress And Plane Strain Analysis –Displacement Models –Generalized Coordinates-Shape Functions-Convergent And Compatibility Requirements –Geometric Invariance – Natural Coordinate System-Area And Volume Coordinates-Generation Of Element Stiffness And Nodal Load Matrices –Static Condensation.
- 4. Isoparametric Formulation-**Concept, Different Isoparametric Elements For 2D Analysis-Formulation Of 4-Noded And 8-Noded Isoparametric Quadrilateral Elements –Lagrangian Elements-Serendipity Elements. **Axi Symmetric Analysis** –Bodies Of Revolution-Axi Symmetric Modelling –Strain Displacement Relationship-Formulation Of Axi Symmetric Elements.
- 5. Three Dimensional FEM-**Different 3-D Elements, 3D Strain –Displacement Relationship- Formulation Of Hexahedral And Isoparametric Solid Element.

**REFERENCE BOOKS:**

1. Finite Elements Methods In Engineering By Tirupati. R. Chandrnpatla And Ashok D. Belegundu – Pearson Education Publications.
2. Finite Element Analysis – Theory & Programming By C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers Finite Elements Methods In Engineering By Tirupati. R. Chandrnpatla, Universities Press India Ltd. Hyderabad.
3. Finite Element Method And Its Application By Desai ,2012, Pearson Publications.
4. Finite Element Methods By Darrel W.Pepper, Vikas Pubilishers
5. Finite Element Analysis And Procedures In Engineering By H.V.Lakshminaryana, 3<sup>rd</sup> Edition, Universities Press, Hyderabad.



6. Finite Element Analysis In Engineering Design By S.Rajasekharan, S.Chand Publications, New Delhi.
7. Finite Element Analysis By S.S. Bhavakatti-New Age International Publishers

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**(17D35201) ARTIFICIAL NEURAL NETWORKS**

**Unit I:**

**Introduction:** History Of Neural Networks, Structure And Functions Of Biological And Artificial Neuron, Neural Network Architectures, And Characteristics Of ANN, Applications, And Basic Learning Rules: Hebbian Learning, Competitive Learning, And Boltzmann Learning.

**Unit-II:**

**Supervised Learning-1:** Single Layer Neural Network And Architecture, McCulloch-Pitts Neuron Model, Perception Model, Perception Convergence Theorem, Adaline, Delta Learning Rule.

**Supervised Learning-2:** Multi Layer Neural Network And Architecture, Madaline, Back Propagation Learning, Back Propagation Algorithm.

**Unit III:**

**Unsupervised Learning-1:** Kohonen Self Organization Networks, Hamming Network And Maxnet, Learning Vector Quantization, Mexican Hat.

**Unsupervised Learning-2:** Counter Propagation Network, Forward Only Counter Propagation Network, Adaptive Resonance Theory (ART) -Architecture, Algorithms.

**UNIT IV:**

**Associative Memory Networks :** Introduction, Auto Associative Memory, Hetero Associative Memory, Bidirectional Associative Memory (BAM) -Theory And Architecture, BAM Training Algorithm-Storage.

**Unit V:**

**Hopfield Network:** Introduction, Architecture Of Hopfield Network, Discrete And Continuous Hopfield Network, Iterative Auto Associative Memory Network (Linear Auto Associative Memory, Brain-In-The-Box Network), Temporal Associative Memory Architecture .

**Text Books:**

1. Jacek M. Zurada , " Introduction To Artificial Neural Systems " – Jaico Publishing, 2006.
2. S.N.Sivanandam , S.N.Deepa, " Introduction To Neural Networks Using Matlab 6.0 " , Tata Mcgraw- Hill Publications, 2006.

**Reference Books:**

1. B.Yegnanarayana ” Artificial Neural Networks ” Phi, Newdelhi, 2005.
2. S.Rajasekaran And G.A.Vijayalakshmi Pai “ Neural Networks. Fuzzy Logic And Genetic Algorithms ”, 2007.
3. James A Freeman And Davis Skapura” Neural Networks Algorithm, Applications And Programming Techniques ”, Pearson Education, 2002.

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**(17D35202) CAD AND COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING**

- 1. Introduction To Computer Aided Design** – Reasons For Implementing CAD – Design Process – Applications Of Computers To Design – Benefits Of Computer Aided Design.  
**Principles Of Computer Graphics** – Introduction, Graphic Primitives, Point Plotting, Drawing Of Lines, Bresenham's Algorithm, C Program To Draw A Line, Circle, Ellipse Using Breasenham's Algorithm.
- 2. Transformation In Graphics** – Coordinate System Used Lin Graphics & Windowing, View Port, 2 – D Transformations, Clipping, 3-D Transformation; C-Graphics.
- 3. Stiffness Method** : Microsoft Excel Procedure For Stiffness Method Of Analysis Step – By Step Procedure Using Excel, Examples Using Excel.
- 4. Analysis Of Beams Using Stiffness Method** : Long Hand Solution Of Single Span Beams, Continuous Beams Solution Of Single Span Beams, Continuous Beams Using Excel.
- 5. Database** : Introduction, Concept Of A Database, Objectives Of Databases, Design Of Data Base, Design Consideration Of Data Base.

**TEXT / REFERENCE BOOKS :**

1. C.S.Krishna Murthy & Rajiv S. – Computer Aided Design, Software & Analytical Tools – Narasha Publishing House India.
2. Computer Aided Design In Rainforced Concrete – Dr L.Shah-Structures Publishers Pune.\
3. IS – 456 -2000
4. Limit State Design – A.Jain.
5. Computer Application – Boyd C.Panbou Mc Graw Hill 1997.
6. Raker D., And Rice H. Inside Aut CAD, BPD Publication, Delhi, 1986.
7. Nancy Andrews – Windows The Official Guide To Microsoft Operation Environment, Micro Soft, 1986.
8. Moshi, F., Rubinstein, Matrix Computer Analysis Of Structures, Prentice Hall 1986.

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**(17D20204) ANALYSIS OF SHELLS AND FOLDED PLATES**  
**(ELECTIVE III)**

- 1. Equations Of Equilibrium :** Introduction, Classification, Derivation Of Stress Resultants, Principles Of Membrane Theory And Bending Theory.
- 2. Cylindrical Shells:** Derivation Of Governing DKJ Equation For Bending Theory, Details Of Schorer's Theory, Applications To The Analysis And Design Of Short Shells And Long Shells. Introduction Of ASCE Manual Co-Efficients For Design.
- 3. Introduction To Shells Of Double Curvature: (Other Than Shells Of Revolution:)** Geometry And Analysis Of Elliptic Paraboloid, Rotational Paraboloid And Hyperbolic Paraboloid Shapes By Membrane Theory.
- 4. Folded Plates:** Folded Plate Theory, Plate And Slab Action, Whitney's Theory, Simpson's Theory For The Analysis Of Different Types Of Folded Plates (Design Is Not Included)
- 5. Shells Of Double Curvature (Surfaces Of Revolution)** .Derivation Of Equilibrium Equations By Membrane Theory, Applications To Spherical Shell And Rotational Hyperboloid

**TEXT / REFERENCE BOOKS:**

1. Design And Construction Of Concrete Shell Roofs By G.S. Rama Swamy – CBS Publishers & Distributors, 485, Jain Bhawan Bhola Nath Nagar, Shahotra, Delhi.
2. Fundamentals Of The Analysis And Design Of Shell Structures By Vasant S.Kelkar Robert T.Swell – Prentice Hall, Inc., Englewood Cliffs, New Jersey - 02632.
3. N.K.Bairagi, Shell Analysis, Khanna Publishers, Delhi, 1990.
4. Billington, Ithin Shell Concrete Structures, Mc Graw Hill Book Company, New York, St. Louis, Sand Francisco, Toronto, London.
5. ASCE Manual Of Engineering Practice No.31, Design Of Cylindrical Concrete Shell Roofs ASC, Newyork.

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**(17D35203) RELIABILITY BASED ENGINEERING DESIGN**  
**(ELECTIVE III)**

1. Basic Statistics And Probability – Concepts Of Structural Safety – Resistance Parameters And Distributions. Probabilistic Analysis Of Loads Live Load & Wind Load
2. Determination Of Reliability, Monte Carlo Study Of Structural Safety.
3. Levels Of Reliability Methods And Their Suitable Adoption In Structural Engineering Elements.
4. Level 2 Reliability Methods Including Advanced Level 2 Method.
5. Reliability Analysis Of Structural Components – Reliability Based Design Determination Of Partial Safety Factors, Code Calibration – Reliability Of Structural Systems Application To Steel & Concrete Structures, Off Shore Structures.

**TEXT / REFERENCE BOOKS :**

1. PALLE THOFT CHRISTENSEN AND M.J.Baker – Structural Reliability Theory And Its Application Springer – Verlag, Berlin Haiderberg, Newyork 1982.
2. R.E. Melchers, Structural Reliability Analysis And Prediction, Elles Harwood, Chisester, England, 1987.
3. A.H.S. Ang And W.H.Tang, Probability Concepts In Engineering Planning And Design Volume II Jhon Wiley, Newyork 1984.
4. Palle Thoft Cristensen And Y.Murotsu Application Of Structural Systems, Reliability Theory Springer – Verlog, Berlin 1986.

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**(17D20207) EARTHQUAKE RESISTANT STRUCTURES**  
**(ELECTIVE III)**

1. **Engineering Seismology :**  
 Earthquake – Causes Of Earthquake – Earthquakes And Seismic Waves – Scale And Intensity Of Earthquakes – Seismic Activity – Measurements Of Earth Quakes – Seismometer- Strong Motion Accelerograph / Field Observation Of Ground Motion – Analysis Of Earthquakes Waves – Earth Quake Motion – Amplification Of Characteristics Of Surface Layers – Earthquake Motion On The Ground Surface;
2. **Vibration Of Structures Under Ground Motion:**  
 Elastic Vibration Of Simple Structures – Modelling Of Structures And Equations Of Motion – Free vibrations Of Simple Structures – Steady State Forced Vibrations – Non Steady State Forced Vibrations – Response Spectrum Representations; Relation Between The Nature Of The Ground Motion And Structural Damage.
3. **Design Approaches:** Methods Of Analysis – Selection Of Analysis – Equivalent Lateral Force Procedure Seismic Base Shear – Seismic Design Co-Efficient - Vertical Distribution Of Seismic Forces And Horizontal Shear – Twisting Moment - Over Turning Moment – Vertical Seismic Load And Orthogonal Effects Lateral Deflection – P-  $\Delta$  Characteristics Effect – Soil Structure Interaction. Seismic – Graphs Study, Earthquake Records For Design – Factors Affecting Accelerogram Characteristics - Artificial Accelerogram – Zoning Map. Dynamic – Analysis Procedure: Model Analysis – Inelastic – Time History Analysis Evaluation Of The Results.
- 4.. **Earthquake – Resistant Design Of Structural Components And Systems:**  
 Introduction – Monolithic Reinforced – Concrete Structures – Precast Concrete Structures – Prestressed Concrete Structures – Steel Structures – Composite – Structures, Masonry Structures – Timber Structures.
5. Fundamentals Of Seismic Planning: Selection Of Materials And Types Of Construction Form Of Superstructure – Framing Systems And Seismic Units – Devices For Reducing. Earthquake Loads,

**TEXT / REFERENCE BOOKS:**

1. Design Of Earthquake Resistant Structures By Minoru Wakabayashi.
2. A.K.Chopra, Structural Dynamics For Earthquake Engineering”, Pearson Publications.
3. R.W.Clough And ‘Dynamics Of Structures’. Mc Graw – Hill, 2<sup>nd</sup> Edition, 1992.
4. N.M Newmark And E.Rosenblueth, Fundamentals Of Earthquake Engineering’ Prentice Hall,1971.
5. David Key, Earthquake Design Practice For Buildings.” Thomas Telford,London,1988
6. R.L. Wegel, Earthquake Engg; Prentice Hall 12<sup>nd</sup> Edition 1989.
7. J.A. Blume, N.M. Newmark, L.H. Corning., Design Of Multi –Storied Buildings For Earthquake Ground Motions’, Portland Cement Association, Chicago,1961
8. I.S.Codes No. 1893,4326,13920.
9. Earthquake Resistant Design By Pankaj Agarwal.

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**(17D35204) MANAGEMENT INFORMATION SYSTEMS**  
**(ELECTIVE IV)**

- 1. Introduction To MIS** – Importance Of Information For Management Decisions – Systems Approach And Information – System Development – Information System Architecture – Quantitative Techniques And Management Information Systems Interfacing.
- 2.** Physical Design Of Computer Sub-Systems, Database Design, File Design, Input-Output And Procedure Design And System Security.
- 3.** MIS Development – Process – System Development – System Life Cycle Method – Structured Development Method, And Prototype Method – Software Development.
- 4.** Information Systems – Computers In Management – MIS Office Automations Decision Support System – Expert System.
- 5.** Implementation, Evaluation And Maintenance Of MIS – Pitfalls In MIS Development.  
System Modeling For MIS System Engineering Methodology For MIS Problem Solving.

**TEXT / REFERENCE BOOKS :**

1. Suresh K.Basandra – Computers To Day, Glagotia Publishers.
2. R.G.Murdicks – Information Systems For Management.
3. Elias M.Award – System Analysis And Design
4. A.Senn – Analysis And Design Information Systems.
5. Jerome Kanter – Managing With Information, Prentice & Hall.
6. C.S.V.Murthy – Management Information Systems Text & Application
7. Himalaya Publishing House – Mumbai.
8. Gordan Davis – Management Information Systems, Mc Graw – Hill Publishers.

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**(17D20210) FRACTURE MECHANICS**  
**(ELECTIVE IV)**

1. **Summary Of Basic Problems And Concepts:**  
 Introduction - A Crack In A Structure - The Stress At A Crack Tip - The Griffith Criterion The Crack Opening Displacement Criterion - Crack Propagation - Closure
2. **The Elastic Crack – Tip Stress Field :**  
 The Airy Stress Function - Complex Stress Functions - Solution To Crack Problems - The Effect Of Finite Size - Special Cases - Elliptical Cracks - Some Useful Expressions
3. **The Crack Tip Plastic Zone:**  
 The Irwin Plastic Zone Correction - The Dugdale Approach - The Shape Of The Plastic Zone - Plane Stress Versus Plane Strain - Plastic Constraint Factor - The Thickness Effect
4. **The Energy Principle:**  
 The Energy Release Rate - The Criterion For Crack Growth - The Crack Resistance (R Curve) - Compliance, The J Integral (Definitions Only)  
**Plane Strain Fracture Toughness:**  
 The Standard Test - Size Requirements - Non-Linearity – Applicability  
**Plane Stress And Transitional Behaviour:**  
 Introduction - An Engineering Concept Of Plane Stress - The R Curve Concept
5. **The Crack Opening Displacement Criterion:**  
 Fracture Beyond General Yield - The Crack Tip Opening Displacement - The Possible Use Of The CTOD Criterion  
**Determination Of Stress Intensity Factors:**  
 Introduction - Analytical And Numerical Methods - Finite Element Methods, Experimental Methods (An Ariel Views Only)

**REFERENCES:**

1. Elementary Engineering Fracture Mechanics-David Broek, Battelle, Columbus Laboratories, Columbus, Ohio, USA
2. Fracture And Fatigue Control In Structures- John M.Barsom, Senior Consultant United States Steel Corporation & Stanley T.Rolfe, Ross H.Forney Professor Of Engineering University Of Kansas & Stanley T.Rolfe, Ross H.Forney Professor Of Engineering, University Of Kansas

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**M.Tech II semester (CASE)**

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**(17D20106) ADVANCED CONCRETE TECHNOLOGY**  
**(ELECTIVE IV)**

1. **Cements And Admixtures:** Portland Cement – Chemical Composition – Hydration, Setting And Finenesses Of Cement – Structures Of Hydrated Cement – Mechanical Strength Of Cement Gel - Water Held In Hydrate Cement Paste – Heat Of Hydration Of Cement – Influence Of Compound Composition On Properties Of Cement – Tests On Physical Properties Of Cement – I.S. Specifications – Different Types Of Cements – Admixtures.
  
2. **Aggregates:** Classification Of Aggregate – Particle Shape And Texture – Bond Strength And Other Mechanical Properties Of Aggregate Specific Gravity, Bulk Density, Porosity, Absorption And Moisture In Aggregate – Soundness Of Aggregate – Alkali – Aggregate Reaction, Thermal Properties – Sieve Analysis – Fineness Modulus – Grading Curves – Grading Requirements – Practical Grading – Road Note No.4 Grading Of Fine And Coarse Aggregates Gap Graded Aggregate – Maximum Aggregate Size.
  
3. **Fresh Concrete:** Workability – Factors Affecting Workability – Measurement Of Workability By Different Tests – Effect Of Time And Temperature On Workability – Segregation And Bleeding – Mixing And Vibration Of Concrete – Quality Of Mixing Water.  
**Hardened Concrete:** Water/Cement Ratio-Abram's Law – Gel Space Ratio – Effective Water In Mix – Nature Of Strength Of Concrete – Strength In Tension And Compression- Griffith's Hypothesis – Factors Affecting Strength – Autogeneous Healing –Relation Between Compression And Tensile Strength – Curing And Maturity Of Concrete Influence Of Temperature On Strength – Steam Curing – Testing Of Hardened Concrete – Compression Tests – Tension Tests – Factors Affecting Strength – Flexure Tests – Splitting Tests – Non Destructive Testing Methods.
  
4. **Elasticity, Shrinkage And Creep:** Modulus Of Elasticity – Dynamic Modulus Of Elasticity – Poisson's Ratio – Early Volume Changes – Swelling – Drying Shrinkage – Mechanism Of Shrinkage – Factors Affecting Shrinkage – Differential Shrinkage – Moisture Movement Carbonation Shrinkage-Creep Of Concrete – Factors Influencing Creep – Relation Between Creep And Time – Nature Of Creep – Effect Of Creep.

5. **Mix Design:** Proportioning Of Concrete Mixes By Various Methods – Fineness Modulus, Trial And Error, Mix Density, Road Note. No. 4, ACI And ISI Code Methods – Factors In The Choice Of Mix Proportions – Durability Of Concrete – Quality Control Of Concrete – Statistical Methods – High Strength Concrete Mix Design. **Special Concrete's:** Light Weight Concretes –Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete – High Density Concrete – Fiber Reinforced Concrete – Different Types Of Fibers - Factors Affecting Properties Of FRC – Applications Polymer Concrete – Types Of Polymer Concrete Properties Of Polymer Concrete and Applications

**TEXT/ REFERENCE BOOKS:**

1. Properties Of Concrete By A.M.Neville – Pearson Publication – 4th Edition
2. Concrete Technology By M.S.Shetty. – S.Chand & Co. ; 2004
3. Design Of Concrete Mix By Krishna Raju, CBS Publishers.
4. Concrete: Micro Structure, Properties And Materials – P.K.Mehta And J.M.Monteiro, Mc-Graw Hill Publishers
5. Concrete Technology By A.R. Santha Kumar, Oxford University Press, New Delhi
6. Concrete Technology By A.M.Neville – Pearson Publication
7. Concrete Technology By M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
8. Non-Destructive Test And Evaluation Of Materials By J.Prasad & C.G.K. Nair , Tata McGraw Hill Publishers, New Delhi

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**(17D35205) CAD LABORATORY II**

1. To Draw A Line Using Bresenhams Line Algorithm
2. To Draw A Circle, Ellipse Using Bresenhams Line Algorithm
3. Reinforcement Detailing In Beam Using Graphics.
4. Reinforcement Detailing In Slabs Using Graphics.
5. Reinforcement Detailing In Foundation Using Graphics.

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**(17D20301) RESEARCH METHODOLOGY**  
**(Elective V-OPEN ELECTIVE )**

**UNIT I**

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

**UNIT II**

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.

Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.

Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

**UNIT III**

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs. Determination – Types of Correlations and Their Applications

**UNIT IV**

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

**UNIT V**

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Text Books:

1. Research Methodology:Methods And Techniques – C.R.Kothari, 2<sup>nd</sup> Edition,New Age International Publishers.
2. Research Methodology: A Step By Step Guide For Beginners- Ranjit Kumar, Sage Publications (Available As Pdf On Internet)
3. Research Methodology And Statistical Tools – P.Narayana Reddy And G.V.R.K.Acharyulu, 1<sup>st</sup> Edition,Excel Books,New Delhi.

REFERENCES:

1. Scientists Must Write - Robert Barrass (Available As Pdf On Internet)
2. Crafting Your Research Future –Charles X. Ling And Quiang Yang (Available As Pdf On Internet)

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**M.Tech III semester (CASE)**

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**(17D20302) HUMAN VALUES AND PROFESSIONAL ETHICS**  
**(Elective V-OPEN ELECTIVE )**

**Unit I:**

**HUMAN VALUES:** Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

**Unit II:**

**ENGINEERING ETHICS:** Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg's theory- Gilligan's theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

**Unit III :**

**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

**UNIT IV:**

**ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK:** Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing riskSafety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

**UNIT V:**

**GLOBAL ISSUES:** Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics .

**Text Books :**

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.



2. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.
4. “Professional Ethics and Morals” by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.

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**(17D20303) INTELLECTUAL PROPERTY RIGHTS**  
**(Elective V-OPEN ELECTIVE )**

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Right, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Right – Nileshmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,