COURSE STRUCTURE
AND
DETAILED SYLLABUS

STRUCTURAL ENGINEERING

For
M.TECH TWO YEAR DEGREE PROGRAMME
(Applicable for the batches admitted from 2020-2021)

VAAGDEVI COLLEGE OF ENGINEERING
(Autonomous)
Bollikunta, Warangal-506 005
Telangana State, India.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

DEPARTEMENT OF CIVIL ENGINEERING
M.TECH STRUCTURAL ENGINEERING

COURSE STRUCTURE
(R20 Regulations applicable for the batches admitted from Academic Year 2020-21)

I Semester

Sl. No	Code	Subjec	L	T	P	Credit
1	M20SE01	Theory of Elasticity	3	0	0	3
2	M20SE02	Behaviour of Concrete Structures	3	0	0	3
3	M20SE12 M20SE13 M20SE14	**Elective –I** Advanced Concrete Technology Matrix Methods of Structural Analysis Structural Stability	3	0	0	3
4	M20SE15 M20SE16 M20SE17	**Elective –II** Building Services Precast and Prefabricated Structures Special Concretes	3	0	0	3
5	M20SE03	Structural Design Laboratory	0	0	4	2
6	M20SE04	Advanced Concrete Technology Laboratory	0	0	4	2
7	M20MC02	Experimental Methods in Structural Engineering	2	0	0	2
8	M20AC02	Stress Management	2	0	0	0
		Total credits	**16**	**0**	**8**	**18**

II Semester

Sl. No	Code	Subjec	L	T	P	Credit
1	M20SE05	Finite Element Analysis of Structures	3	0	0	3
2	M20SE06	Structural Dynamics	3	0	0	3
3	M20SE18 M20SE19 M20SE20	**Elective III** Structural Health Monitoring Repair and Rehabilitation of Structures Analysis and Design of Bridges	3	0	0	3
4	M20SE21 M20SE22 M20SE23	**Elective IV** Theory of Plates Tall Buildings Design of Prestressed Concrete Structures	3	0	0	3
6	M20SE07	Advanced Computing Laboratory	0	0	4	2
7	M20SE08	Numerical Analysis Laboratory	0	0	4	2
8	M20SE09	Seminar	0	0	4	2
9	M20AC03	English for Scientific Communication	2	0	0	0
		Total credits	**14**	**0**	**12**	**18**

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

DEPARTEMENT OF CIVIL ENGINEERING
M.TECH STRUCTURAL ENGINEERING

COURSE STRUCTURE
(R20 Regulations applicable for the batches admitted from Academic Year 2020-21)

III Semester

Sl. No	Code	Subject	L	T	P	Credit
1	M20SE24 M20SE25 M20SE26	**Elective V** Design of Steel Concrete Composite Structures Offshore and Underwater Construction Earthquake Analysis and Design of Structures	3	0	0	3
2	M20MB22 M20MB30 M20MA01	**Open Elective** Business Law and Ethics Project Management Advanced Mathematical Modelling	3	0	0	3
3	M20SE10	Dissertation Phase I	0	0	20	10
Total credits			**6**	**0**	**20**	**16**

IV Semester

Sl. No	Code	Subject	L	T	P	Credit
1	M20SE11	Dissertation Phase II	0	0	32	16
Total credits			**6**	**0**	**32**	**16**

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE01) THEORY OF ELASTICITY

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

Unit I

Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium - boundary conditions – Strain Displacement Relations - compatibility equations - stress function

Unit II

Two dimensional problems in rectangular coordinates - solution by polynomials - SaintVenants principle - determination of displacements - bending of simple beams – Simple Supported and Cantilever Beam.

Unit III

Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.

Unit IV

Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses Stress Tensor – Strain Tensor- Homogeneous deformation - principal axes of strain-rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy..

Unit V

Torsion of non-circular sections - St. Venant's theory – Torsion of elliptical sections - Torsion of triangular sections - Prandtl's membrane analogy - Torsion of rolled profiles - Stress concentration around re-entrant corners - Torsion of thin walled tubes - Stress concentration.

Reference Books:

1. S. Timoshenko and J N Goodier, Theory of Elasticity, 3rd Edition McGraw-Hill, 2017.
2. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1988.
3. C.T. Wang, "Applied Elasticity", McGraw-Hill Inc., US 1963.
4. Mohammed Amin, Computation Elasticity, Narosa Publications, 2017.
5. A.I. Lurie, "Theory of Elasticity", Springer Science, 2005

Course outcomes:

After the completion of this course, the students should be able to

CO 1 Apply principles of elastic theory to estimate stresses and strains of structural engineering problems.

CO 2 Apply linear elasticity in the design and analysis of structures such as beams, plates, shells and sandwich composites

CO 3 Solve engineering problems such as thick cylinders, rotating discs, shafts and complex loading on structural members..

CO 4. Model and analyze homogenous and isotropic elastic plane problems.

CO 5 Analyze the structural sections subjected to torsion

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE02) BEHAVIOUR OF CONCRETE STRUCTURES

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

UNIT-I

A brief overview of the philosophy of limit state design, Behavior of concrete flexural members, general equations for calculation of moment capacities at ultimate limit state and at limit state of local damage, flexural rigidity, calculation of deflection, redistribution of moments, design examples.

UNIT-II

Axially loaded compression members combines axial load and uniaxial bending. Interaction diagrams, combined axial load and biaxial bending, slender compression members, design example using I.S.456-2000.

UNIT-III

Shear cracking of ordinary reinforced concrete members, web reinforcement, design examples, shear in tapered beams, Kani's theory of shear stress. Development length of reinforcement, anchorage. Significance of Torsion, Torsional resistance of concrete beams, reinforcement for torsion, Skew bending theory for torsion design examples.

UNIT-IV

Yield line theory of slabs, Analysis and design of Slabs.

UNIT-V

Serviceability design of RC Structures - Serviceability - Deflection- Short term-Long term deflection due to Shrinkage, Creep- Cracking-Crack width calculation

Reference Books:

1. Varghese P.C, Design of Reinforced Concrete Structures, Prentice hall of India, 2004.
2. Krishnamurthy, K.T, Gharpure S.C. and A.B. Kulkarni – Limit design of reinforced concrete structures, Khanna Publishers, 1985.
3. R. Park and T. Paulay, "Reinforced Cement Concrete Structures", MISL-WILEY Series, Wiley India Pvt. Ltd, 2009
4. N Krishna Raju, "Design of Reinforced Concrete Structures: IS:456-2000", 4th edition CBS Publishers & Distributors; 2016
5. C K Wang, C G Salmon, "Reinforced Concrete Design", 6th Edition John Wiley & Sons 1998.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1 Understand the behaviour of flexural members
CO 2 Design of columns under combined loading
CO 3 Analysis the beam in shear and torsion
CO 4 Understand the concept of Yield line theory
CO 5 Detail the reinforcement of RC Structures as per codal provisions

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE12) ADVANCED CONCRETE TECHNOLOGY
(Elective – I)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

UNIT – I

Concrete Making Materials: Cement- Bogue's compounds – Hydration Process– Types of cement – Aggregates – Gradation Charts – Combined aggregate-Alkali Silica Reaction - Admixtures – Chemical and Mineral admixtures.

UNIT – II

Hardened Concrete: Abram's law- Gel space ratios, Maturity Concept – Stress Behavior – Creep and Shrinkage – Durability tests on concrete - Non destructive testing of concrete. Microstructure and properties of hardened concrete-

UNIT - III

High Strength Concrete – Micro structure – Manufacturing and Properties- Design of HSC Using Entroy Shaklok Method- Ultra High Strength Concrete.
High Performance Concrete- Requirements and properties of High Performance Concrete - Design Considerations.

UNIT –IV

Special Concrete: Self Compacting concrete – Polymer concrete – Fiber reinforced concrete– Reactive Powder concrete – Requirements and Guidelines – Advantages and Applications. Light weight concrete. Concrete mix design: Quality Control - Quality assurance - Quality audit- Mix Design method - BIS method, ACI method, DOE method.

UNIT –V

Form work – materials – structural requirements – form work systems – connections – specifications – design of form work – shores – removal for forms – reshoring – failure of formwork.

Reference Books:

1. Neville, A. M., "Properties of Concrete," 4th and final Edition, 2003.
2. Mehta, P. K. and Monteiro, P. J. M., "Concrete: Microstructure, Properties, and Materials," 3rd Edition, 2006.
3. Shetty M S, Concrete Technology, - Theory and Practice", S.Chand and Company, New Delhi, 1992.
4. Mindess S and Young JF, "Concrete", Prentice-Hall, USA,1981
5. H. Okamura and K. Ozawa, "Mix Design for Self-Compacting Concrete," Concrete Library of JSCE, No. 25, 1995, pp. 107 – 120
6. G. H. Tattersall, "Workability and Quality Control of Concrete," E&FN Spon, London, 1991
7. Hewlett P C "Concrete Admixtures use and applications", ed M R Rixom, The Concrete press, London, 1972

Course Outcomes:

After the completion of this course, the students should be able to

CO 1 Develop an advanced knowledge on the chemistry and hydration of cement based materials
CO 2 Understand the design principles of IS, ACI and DOE methods
CO 3 Understand the engineering properties of special concretes such as high- performance concrete, self-compacting concrete, fiber reinforced concrete, etc.
CO 4 Understand t\principles of quality control and quality audit
CO 5 Understand the safety steps involved in the design of form work and false work

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE13) MATRIX METHODS OF STRUCTURAL ANALYSIS
(Elective – I)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

UNIT-I

Generalised Measurements- Degrees of freedom- Constrained Measurements -Behaviour of structures - Principle of superposition- Stiffness and flexibility matrices in single, two and n-co-ordinates - Structures with constrained measurements.

UNIT-II

Stiffness and flexibility matrices from strain energy - Betti's law and its applications- Determinate and indeterminate structures - Transformation of element matrices to system matrices - Transformation of system vectors to element vectors.

UNIT-III

Flexibility method applied to statically determinate and indeterminate structures – Choice of redunants - Transformation of redundant -Internal forces due to thermal expansion and lack of fit.

UNIT-IV

Displacement method - Internal forces due to thermal expansion and lack of fit - Application to symmetrical structures – Code system in the stiffness methods - Computer program for the code system - Comparison between stiffness and flexibility methods.

UNIT-V

Analysis by substructures using the stiffness method and flexibility method with tridiagonalization- Analysis by Iteration method - frames with prismatic members - non-prismatic members.

Reference Books:

1. Moshe, F., Rubenstein, Matrix Computer Analysis of Structures, Prentice Hall, New York, 1966.
2. Kanchi, Matrix Structural Analysis, Wiley Eastern Ltd., Newdelhi 1981.
3. Rajasekaran S, Computational Structural Mechanics, Prentice Hall of India, New Delhi, 2001.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1 Distinguish between stable and unstable and statically determinate and indeterminate structures.
CO 2 Apply strain energy (Betti's law) for determinate and indeterminate structures
CO 3 Form the stiffness and loading matrices of an idealized structure
CO 4 Analyze indeterminate beams and frames using displacement and flexibility methods
CO 5 Analysis the plane and space trusses, plane and space frame structures

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE14) STRUCTURAL STABILITY
(Elective – I)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

UNIT – I

Beam Columns: Differential equations for beam columns with concentrated loads – continuous lateral loads-couples- beam columns with built in ends – continuous beams with axial load – application of trigonometrically series – Effects of initial curvature on deflections – Determination of allowable stresses.

UNIT - II

Elastic Buckling of bars and frames: Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns.

UNIT - III

In Elastic Buckling: Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions

UNIT - IV

Torsion Buckling: Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section - Torsional buckling – Buckling by torsion and flexure.

UNIT – V

Lateral buckling of simply supported Beams: Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant compression in one and two directions.

Reference Books:

1. Timoshenko.S.P, and Gere.J.M, “Theory of Elastic Stability”, McGraw Hill Book Company, 1963.
2. Theory of Beam- Columns Vol I by Chem. &Atste Mc. GrawHill
3. Ashwini Kumar, “Stability Theory of Structures”, Allied publishers Ltd., New Delhi,2003.
4. Chajes, A. “Principles of Structures Stability Theory”, Prentice Hall,1974.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Understand stability of static and dynamic equilibrium.
CO 2 Determine the buckling loads for simple columns and frames.
CO 3 Analyse the beams for lateral - torsional buckling
CO 4 Differentiate how the tangent modulus and double modulus theories of inelastic buckling led to the column paradox.
CO 5Apply advanced numerical techniques to bucking analysis of structures.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE15) BUILDING SERVICES
(Elective – II)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

Unit I

Orientation and Planning: Selection of site, Orientation of building, Design of residential buildings with particular reference to grouping and circulation. General building requirements: Open spaces in and around buildings for lighting and ventilation, Minimum sizes and height of roofs, Rat and Termite proofing of buildings, Lightning protection of buildings.

Unit II

Fire protection of buildings: Important considerations in fire protection, Fire resisting, Properties of common building materials, Fire safety and exit requirements.

Unit III

Prefabrication systems in residential buildings: Planning and modules and sizes of components in prefabrication, Testing of components, Manufacturing and erection guide lines

Unit IV

Miscellaneous structures: Shell structures, Domes, Folded plate structures, Skeletal and space frame structures, Grain storage structures, Earthquake resistant structures.

Unit V

Building services: Lighting and Ventilation, Electrical installation, Air-conditioning and heating, Acoustics and Sound insulation, Plumbing services.

Reference Books:

1. National building code of India, BIS, 2016
2. Building construction, Arora and Bindra, Dhanpatrai &Sons,2012
3. Hand book of Housing Statistics,NBO 2003

Course Outcomes:

After the completion of this course, the students should be able to
CO1 Design residential buildings keeping in the view of orientation and planning.
CO2 Understand the fire protection in buildings.
CO3 Analyse and design prefabrication systems in buildings.
CO4 Understand different types of space structures.
CO5 Plan and design building services for lighting and ventilation, electrical and HVAC systems

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE16) PRECAST AND PREFABRICATED STRUCTURES
(Elective – II)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

Unit I
Need for prefabrication – General Principles of Prefabrication - Comparison with monolithic construction, types of prefabrication, site and plant prefabrication, economy of prefabrication, modular coordination, standardization – Materials – Modular coordination – Systems – Production – Transportation – Erection.

Unit II
Prefabricated Load Carrying Members-Planning for components of prefabricated structures, disuniting of structures, design of simple rectangular beams and I-beams, handling and erection stresses, elimination of erection stresses, beams, columns, symmetric frames.

Unit III
Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls. Joints - Joints for different structural connections, effective sealing of joints for water proofing, provisions for non-structural fastenings, expansion joints in precast construction.

UNIT IV
Production Technology - Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting Technology - Equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.

UNIT V
Applications - Designing and detailing of precast unit for factory structures, purlins, principal rafters, roof trusses, lattice girders, gable frames, singe span single storied simple frames, single storied buildings, slabs, beams and columns.
Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse

Reference Books:
1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
3. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
4. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
5. Mokk. L, (1964), Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest.

Course outcomes:
After the completion of this course, the students should be able to
CO1 Analyze the prefabricated load carrying members
CO2 Analyze the production technology of prefabrication
CO3 Design and detailing of precast unit for factories
CO4 Design single storied simple frames

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE17) SPECIAL CONCRETES
(Elective – II)

M. TECH- I Semester **L/T/P/C**
3/0 /0 /3

UNIT – I

Fibre reinforced concrete - types of fibre – properties of fibres – factors affecting the properties of FRC – Workability – mixing - application. Different types of fibre reinforced concrete – current development in FRC. Ferrocement – Casting Techniques – Applications

UNIT - II

Light weight concrete – light-weight Aggregate concrete – Structural light-weight concrete – workability – Design of light-weight Aggregate concrete Mix – mixing procedure – Aerated concrete – No-fines concrete. High density concrete – Types of radiation Hazards – Use of Concrete for radiation shielding

UNIT - III

Introduction – High volume fly ash & slag concrete - Mechanism of hydration – Mix proposition – properties of Fresh & Hardened Concrete. Durability Aspects of High Volume fly Ash Concrete and slag concrete

UNIT - IV

Introduction – Application- General principle – Latex modification, Re dispersible polymer powders – Water Soluble Polymers – liquid Resins – Monomers. Latex Modified Systems – Materials – Mix Proportioning – Mixing – Placing & Curing - Types of polymer concrete, Durability properties – Applications

UNIT - V

High Strength and High Performance Concrete – Self compacting concrete, self curing concrete, Geopolymer concrete, Bacterial concrete, Nano materials in concrete

Reference Books :

1 M.S.Shetty, “Concrete Technology”, S.Chand and Company Ltd. Delhi, 2011.
2 A.M.Neville, “Properties of Concrete”, Prentice Hall, 2012, London.
3 IS: 456-2007: “Indian Standards Code of Practice for Plain and Reinforced Concrete”.
4 M.L.Gambir, “Concrete Technology”, Tata McGraw Hill, Publishing Co. Ltd, New Delhi, 2006.

Course outcomes:

After the completion of this course, the students should be able to

CO1Acquire knowledge on constituent materials of concrete and tests.
CO2Gain knowledge about chemical and mineral admixtures of concrete
and their effects on concrete properties.
CO3Apply the principles of mix proportioning based on different methods
CO4Understand the testing of fresh concrete and hardened concrete, Young’s modulus and durability.
CO5Compare different types of concretes, their properties and applications in construction field.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE03) STRUCTURAL DESIGN LABORATORY

M. TECH- I Semester **L/T/P/C**
0 /0 /4 /2

Experiments:

1. Program using arrays and functions for matrix manipulation.
2. Programs to draw bending moment and shear force diagrams.
3. Program for design of slabs.
4. Program for design of beams.
5. Program for design of column and footing.
6. Analysis of truss.
7. Analysis of multistoried space frame.
8. Analysis of Bridge deck slab.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Create a program using arrays and functions for matrix manipulation

CO 2Create a program to draw bending moment and shear force diagrams

CO 3Develop programs to design slab, beams, columns and footings

CO 4Develop programs to analyze truss, multi storey frame and bridge deck slab

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE04) ADVANCED CONCRETE TECHNOLOGY LABORATORY

M. TECH- I Semester **L/T/P/C**
0/0 /4 /2

Experiments:

1 Tests on cement - Consistency, Setting times, Soundness, Specific Gravity and Compressive Strength.

2. Test on Fine Aggregate: Surface Moisture Content & Absorption, Silt Content Test, Bulking of Sand, Sieve Analysis, Fineness Modulus and Specific gravity.
3. Test on Coarse aggregate: Crushing Value, Impact Value, Shape test, Specific gravity and water absorption test
4. Design of concrete mix by IS method and casting
5. Test on fresh concrete (a) Slump cone test (b) Compaction Factor test
6. Test on hardened concrete- Study of stress and strain characteristics, and determination of Young's modulus- Compression Test - Split Tensile Test
7. a)Test on concrete using Non - Destructive Testing Techniques
    i. Ultrasonic method
    ii. Rebound Hammer method
    iii. Comparison of destructive test results with the NDT results
8. Workability tests on fresh self compacting concrete
9. Air Entrainment test on fresh concrete.
10. Permeability test on hardened concrete.

Course Outcomes:
After the completion of this course, the students should be able to
CO 1Test Fineness, Specific Gravity, Setting Time, Soundness and Compressive Strength of Cement
CO 2Test physical properties of Coarse Aggregate and Fine Aggregate
CO 3Test Workability of Fresh Concrete and Compressive strength, Split Tensile Strength of Hardened Concrete
CO 4Demonstrate ability to make selection of materials based on their properties, behaviour and intended use in design and construction

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20MC01) EXPERIMENTAL METHODS IN STRUCTURAL ENGINEERING

M. TECH- I Semester **L/T/P/C**
2/ 0 /0 /2

Unit I

Hydraulic loading systems, strain gauges, strain and force measuring devices. Mechanical, acoustical, optical and electrical resistance strain gauges – construction of Wheatstone bridge circuits – gauge factor, gauge sensitivity, temperature compensation.

Unit II

Dimensional analysis, Buckingham's Pi theorem, scale factors and dynamic similitude; size effects; Analysis of experimental data: error and uncertainty in experiment, measurement systems, accuracy in models and reliability of results.

Unit III

Experimental planning, design and implementation: testing sequence and loading systems, devices, actuators and their control, Instrumentation: mechanical, electrical, electronic system and their calibration, types of sensors for displacement (LVDT), velocity, acceleration, pressure, loads (load cells), strains, full-field measurements.

Unit IV

Static and dynamic data acquisition system and data processing: analog systems, digital systems using personal computers, dynamic measurement, numerical and graphical data processing and archiving.

Unit V

Theory of Photo Elasticity: Introduction, Temporary double refraction - The stress optic law - Effects of stressed model in a Polaris cope for various arrangements - Fringe sharpening, Brewster stress optic law.

Reference Books:

1 Dalley .J.W and Riley.W.F, "Experimental Stress Analysis", McGraw Hill Book Company, N.Y.1991.
2. Harris and Sabnis., " Structural Modelling and Experimental Techniques",CRC Press, 1999.
3. Reese and Kawahara., "Hand book of structural testing", Prentice Hall,1993.
4. Ganesan.T.P, "Model Analysis of Structures", University Press, India, 2000.
6. Sadhu Singh, "Experimental stress analysis", Khanna Publishers, 1981.

Course outcomes:

After the completion of this course, the students should be able to

CO 1Apply different measuring techniques to study the behaviour of structural materials and members
CO 2Plan, calibrate and test different structural systems
CO 3Analyze experimental data for error, accuracy, uncertainty and reliability
CO 4Measure the static and dynamic experimental data
CO 5Apply advanced numerical and graphical data processing systems

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20AC02) STRESS MANAGEMENT

M. TECH- I Semester **L/T/P/C**
2/ 0 /0 /0

UNIT I

Understanding Stress :Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress -sources of stress – consequence of stress-burnout-symptoms of Burnout- stress verses Burnout-model of stress-strategies for coping stress (individual and organizational strategies) –case study

UNIT II

Time Management: Techniques – Importance of Planning the day –developing concentration – Prioritizing Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say "No"

UNIT III

Career plateau : Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV

Crisis management :Implications – People issues – Structure issues – Environmental issues – Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – role of group cohesion and team spirit.

UNIT V

Self-development: Improving personality – Leading with Integrity – Enhancing Creativity – Effective decision making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

ReferenceBooks

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi
2. Charavathy.S.K, "Human Values for Manager", McGraw Hill/Henely Management Series
3. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi
4. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

Course outcomes:

After the completion of this course, the students should be able to

CO 1Burnout the causes of stress
CO 2Control the time management
CO 3Identify the right career path
CO 4Handle the difficult work situation
CO 5Manage the career life without stress

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE05) FINITE ELEMENT ANALYSIS OF STRUCTURES

M. TECH- II Semester **L/T/P/C**
3/ 0 /0 /3

Unit I

Introduction - Background and general description of the method – Applications. Methods of Structural Analysis - Review of various classical methods of Structural analysis Matrix methods- Stiffness and Flexibility methods.

Unit II

Theory of Finite Element method - Variational method-Discretisation concept- Concept of element – various elements shapes – displacement models – Convergence- shape functions.

Unit III

Finite Element Analysis - Development of shape functions for different elements-Spring-TrussBeam-Plane elements- Plane stress and plane strain-Assemblage of elements construction of stiffness matrix and loads – boundary conditions –patch test-solution of overall problem.

Unit IV

Isoparametric Formulation -Concept of Isoparametric element – One and Two dimensional elements-Natural coordinates- Development of Higher order elements- Lagrange –Serendipity – Interpolation-formulation of element stiffness and loads.

Unit V

Application to Solid Mechanics problems - Analysis of Trusses – Beams – Frames - Axisymmetric elements.

Reference Books:

1. 1. Chandrupatla Belegundu, “Finite Element Method”, McGraw-Hill, 1997.
2. R D Cook, “Concepts and Applications of Finite Element Analysis”, Willey Publication, 1995.
3. O.C. Zeinkiewicz, “Finite Element Method: Its Basic and Fundamentals”, 6th Edition, Butterworth Heinemann, 2007.
4. P Seshu, “Textbook of Finite Element Analysis”, 1st Edition, PHI, 2009.

Course outcomes:

After the completion of this course, the students should be able to

CO1Understand the fundamental concepts of the Finite Element Method (FEM).
CO2Make use of shape function and interpolation function to study structural behavior.
CO3Apply linear and quadratic elements in the finite element analysis of various types of structures.
CO4Gain knowledge on basic concept on non linear analysis
CO5Learn and apply finite element solutions to varies solid mechanics problems.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE06) STRUCTURAL DYNAMICS

M. TECH- II Semester **L/T/P/C**
3/ 0 /0 /3

UNIT I:

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation - Dynamic magnification factor – Phase angle –Bandwidth

UNIT II

Introduction to Structural Dynamics: Fundamental objectives of dynamic analysis - Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.

Single Degree of Freedom Systems: Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT III

Multi Degree of Freedom Systems: Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion - Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates

- Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis- Analysis of second and higher modes - Holzer method - Basic procedure.

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Introduction - Excitation by rigid base translation - Lumped mass approach - SDOF and MDOF systems - I. S. Code methods of analysis for obtaining response of multi storey buildings.

Reference Books:

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, Newyork
2. Structural Dynamics by Mario Paz, C.B.S Publishers, NewDelhi.
3. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
4. I.S: 1893 - 1984, "Code of practice for Earthquake resistant design of Structures" and latest I.S: 1893 - 2002 (version)Part-1

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Understand the fundamental concepts of SDOF and MDOF systems.

CO 2Characterize the dynamic properties of a structure for various dynamics systems.

CO 3Calculate the natural frequency of a system using equilibrium or energy methods.
CO 4Determine the effect of viscous damping on the response of a freely vibrating system.
CO 5Evaluate the fundamentals of earthquake analysis.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE18) STRUCTURAL HEALTH MONITORING
(Elective – III)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

UNIT I

Introduction - Definition of SHM – Classification, Types and Components of SHM – Advantages and Benefits of SHM.

UNITII

Sensing Technologies: Strain Measurement – LVDT – Temperature Sensors – Fiber Optic Sensing Technology - DIC.

UNIT III

Methodology : Sensors – Selection of Sensors – Installation and placement – Data acquisition – Communication – Processing and Analysis – Staorage – Dianostics and Prognostics – Retrieval of data.

UNIT IV

Testing: Static Field Testing – Dynamic field testing - Stress history data - Dynamic load allowance tests - Ambient vibration tests - Forced Vibration Method - Dynamic response methods

UNIT V

Data Acquisition: Static data acquisition systems - Dynamic data acquisition systems - Components of Data acquisition system - Hardware for Remote data acquisition systems.Remote Structural health monitoring: Remote Structural Health Monitoring - Importance and Advantages – Methodology – IoT applications in SHM – Application Machine leaning Techniques in SHM.

Reference Books:

1.Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, “Structural Health Monitoring”, John Wiley and Sons, 2006.
2. Douglas E Adams, “Health Monitoring of Structural Materials and Components -Methods with Applications”, John Wiley and Sons, 2007.
3. J.P. Ou, H. Li and Z.D. Duan, “Structural Health Monitoring and Intelligent Infrastructure Vol-1”, Taylor and Francis Group, London, U.K, 2006.
4. Victor Giurglutiu, “Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc., 2007.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Understand the various components of SHM systems
CO 2Perform response measurements using various types of sensors.
CO 3Gain experience in static and dynamic field testing.
CO 4Select software and hardware required for remote health monitoring of structures.
CO 5Analyze the data using DAQ system.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE19) REPAIR AND REHABILITATION OF STRUCTURES
(Elective – III)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

UNIT – I

Failure of Structures

Review of the construction theory – performance problems – responsibility and accountability – case studies – learning from failures – causes of distress in structural members – design and material deficiencies – over loading

UNIT – II

Diagnosis and Assessment of Distress

Visual inspection – non destructive tests – ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications – pullout tests – Bremor test – Windsor probe test – crack detection techniques – case studies – single and multistorey buildings – Fibre optic method for prediction of structural weakness

UNIT – III

Environmental Problems and Natural Hazards

Effect of corrosive, chemical and marine environment – pollution and carbonation problems – durability of RCC structures – damage due to earthquakes and strengthening of buildings – provisions of BIS 1893 and 4326

UNIT – IV

Modern Techniques of Retrofitting

Structural first aid after a disaster – guniting, jacketing – use of chemicals in repair – application of polymers – ferrocement and fiber concretes as rehabilitation materials – strengthening by pre-stressing – case studies – bridges – water tanks – cooling towers – heritage buildings – high rise buildings.

UNIT – V

Seismic Retrofitting of reinforced concrete buildings

Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame building – Structural damage due to the discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings – Structural level (global) retrofits methods; Member level (local) retrofit methods; Comparative analysis of methods of retrofitting

References Books

1. Diagnosis and treatment of structures in distress by R.N.Raikar, Published by R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai,1994.
2. Dovkaminetzky, Design and Construction Failures, Galgotia Publication, New Delhi, 2001
3. Jacob Feld and Kenneth L Carper, Structural Failures, Wiley Europe

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Learn various distress and damages to concrete and masonry structures.
CO 2Understand NDT techniques for condition assessment of structures.
CO 3Describe and apply the importance of quality control in concrete construction.
CO 4Identify repairs and remedies to be adopted for rehabilitation of buildings.
CO 5Perform structural auditing of the building.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE20) ANALYSIS AND DESIGN OF BRIDGES
(Elective – III)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

Unit I

Introduction – Bridge components - Classification – Investigation for bridges – Loads and Loading standards – IRC and Railway loads – Impact.

Unit II

Bridge substructure - Determination of maximum flood discharge - Determination of linear water way - Determination of maximum depth of scour - Loads acting on substructure - Design of abutment, pier and pier cap - Design of well elements - Sinking of wells.

Unit III

Bridge Superstructure - Pigeaud's curves method for design of slab - Analysis of beams– Courbon's Method – Hendry Jaeger Method – Guyon and Massonet Method - Box Girder Bridges - Grillage analogy.

Unit IV

Cable Bridges - Advantages - Arrangement of stay cables - types of towers - Linear analysis of cables and towers

Unit V

Bridge Bearings and expansion joints - Functions, types and selection of bearings - Bearing materials - Design of elastomeric bearings for different conditions - Expansion joints – types of expansion joints

Reference Books:

1. Swami Saran, "Analysis and Design of Substructures", Oxford & IBH Publishing Co., 1996.
2. J.E. Long, "Bearings in Structural Engineering", Newnes Butterworth & Co., 1974.
3. R.E. Rowe, "Concrete Bridge Design", 1st Edition, Elsevier Science and Technology,1962.
4. Jaeger & Bakht, "Bridge Analysis by Microcomputer", Mc Graw Hill, 1989.
5. Maisel and Roll, "Method of Analysis and Design of Concrete Box Beams with Side Cantilever", Cement and Concrete Associations, 1974.

Course outcomes:

After the completion of this course, the students should be able to

CO 1 Apply the codal provisions for loading and design standards of bridges.
CO 2 Design the substructure including pier and pier cap and well elements.
CO 3 Design the superstructure of bridge using different methods.
CO 4 Design girder bridges and cable stayed bridges.
CO 5 Design and select materials suitable for bearings.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE21) THEORY OF PLATES
(Elective – IV)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

UNIT I

Cylindrical Bending : Different kind of plates – Assumptions - Derivation of differential equation for cylindrical bending of long rectangular plates - Analysis of uniformly loaded rectangular plates with edges simply supported and fixed subjected to uniform load.

Pure Bending of Plates : Slope and curvature of slightly bent plates – Relations between moments and curvature - Particular cases of pure bending - Strain energy in pure bending – Energy methods like Ritz and Galerk in Methods to rectangular plates subjected to simple loadings.

UNITII

Small Deflection Theory of Thin Rectangular Plates:

Assumptions – Derivation of governing differential equation for thin plates – Boundary conditions – simply supported plate under sinusoidal load – Navier's solution –Application to different cases–Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT III

Circular Plates : Symmetrical loading – Relations between slope, deflection, moments and curvature– Governing differential equation – Uniformly loaded plates with clamped and simply supported edges– Central hole – bending by moments and shearing forces uniformly distributed.

Orthotropic Plates: Introduction – Bending of an isotropic plates - Derivation of governing differential equation

– Determination of Rigidities in various cases like R.C. slabs, corrugated sheet – Application to the theory of grid works.

UNIT IV

Plates on Elastic Foundations: Governing differential equation – deflection of uniformly loaded simply supported rectangular plate – Navier and Levy type solutions - Large plate loaded at equidistant points by concentrated forces P.

UNIT V

Buckling of Plates: Governing equation for Bending of plate under the combined action of in-plane loading and lateral loads – Buckling of rectangular plates by compressive forces acting in one and two directions in the middle plane of plate

Finite Difference Methods: Introduction - Application to rectangular plates subjected to simple loading.

References Books:

1. Timoshenko and Krierger, "Theory of Plates and Shells", 2nd Edition, Tata McGraw Hill, 2010.
2. AnselC.Ugural, "Stresses in plate and shells", McGraw Hill International Edition, 1999.
3. Bairagi, "Plate Analysis", Khanna Publishers, 1996.
4. Bulson.P.S.,"Stability Of Flat Plates., American Elsevier Publisher. Co.,1969.
5. Chandrashekahara, K. Theory of Plates, University Press (India) Ltd., Hyderabad, 2001.
6. Reddy J N, "Theory and Analysis of Elastic Plates and Shells", McGraw Hill Book Company, 2006.

Course Outcomes:

After the completion of this course, the students should be able to

CO1Understand the behavior of cylindrical bending in plates

CO2Analyze plates under different boundary connections by various classical methods.

CO3Perform cylindrical bending of long rectangular plates, pure bending of rectangular and circular plates.

CO4Understand the behaviour of orthotropic plates, grids and folded plates.

CO5Understand the behavior of plates under the combined in-plane and lateral loading.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE22)TALL BUILDINGS
(Elective – IV)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

Unit-I

Introduction : Classification of Buildings – Low-rise, medium-rise, high-rise – Evolution of tall buildings – Ordinary framed buildings & Shear-wall buildings – Behaviour of buildings under lateral loads like Wind loads, Earthquake loads & Blast loads – Basic structural & functional design requirements –Strength, Stiffness & Stability.

Unit-II

Lateral load resisting elements : Frames, Shear walls & Tubes – Shear, Bending & combined modes of deformation – Structural behavior of Rigid frames – Simplified methods of analysis – Substitute frame method, Portal method, Cantilever method, Equivalent frame method –Structural behaviour of Shear walls – Approaches of analysis – Elastic continuum approach & Discrete approach -- Structural behavior of Tubes– Actions.

Unit-III

Choice of System for a Building : Frame building, Shear wall building, Shear walls acting with frames, Single framed tubes – Other structural forms – Staggered Wall-beam system, Tube-in-tube system, Base isolation technique for earthquake resistance. Load distribution in a tall building – Load resisted by different shear walls & frames – Determinate & Indeterminate problems – Equivalent Stiffnessmethod.

Unit-IV

Methods of Analysis: Shear walls without Openings – Estimation of Stiffness by simple Cantilever theory & Deep beam theory – Shear walls with Openings – Equivalent frame for large openings – Muto's method for small openings –Elastic Continuum approach – Coull&Chowdhry's method – Design Charts – Limitations of Continuum approach. Shear wall- Frame Interaction : Sharing of loads between wall & frame - Different methods –comparison

Unit-V

Modern Methods: Analysis of Tall buildings by Stiffness method – Software's for analysis of tall buildings.

Reference Books:

1. Beedle.L.S., "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
2. Bryan Stafford Smith and Alexcoull, "Tall Building Structures - Analysis and Design", John Wiley and Sons, Inc., 2005.
3. Gupta.Y.P.,(Editor), Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,1995.
4. Lin T.Y and Stotes Burry D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.
5. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 1988.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1 Study the behavior of different types of tall structural systems

CO 2 Analyze tall structures for vertical and lateral loads with various methods and approaches

CO 3 Gain knowledge to select appropriate type of tall building depending on physical factors

CO 4 Understand approximate analysis, accurate analysis and reduction techniques

CO 5 Acquisition of software skills for analysis and design of Tall Buildings

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE23) DESIGN OF PRESTRESSED CONCRETE STRUCTURES
(Elective – IV)

M. TECH- II Semester **L/T/P/C**
3/0 /0 /3

UNIT I

Introduction – Prestressing Systems – Pre tensioning and Post tensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section - Pressure Line or Thrust Line – Concept of Load Balancing - Losses of Prestress – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep – Relaxation of Stress in Steel – Friction – Anchorage Slip.

UNIT II

DEFLECTIONS OF PRESTRESSED CONCRETE MEMBERS: Importance of Control of Deflections–FactorsInfluencingDeflection–Short-termDeflectionsofUncrackedMembers- Prediction of Long-time Deflections – Deflections of Cracked Members – Requirements of IS1343-2012. **Ultimate Flexural Strength of Beams:** Introduction, Flexural theory using first principles – Simplified Methods – Ultimate Moment of Resistance of untensioned Steel.

UNIT III

COMPOSITE CONSTRUCTIONS: Introduction, Advantages, Types of Composite Construction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections-Deflection of Composite Beams. Design of Composite sections.

UNIT IV

PRESTRESSED CONCRETE SLABS: Types of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.

Prestressed Concrete Pipes and Poles : Circular prestressing- Types of Prestressed Concrete Pipes- Design of Prestressed Concrete Pipes - Prestressed Concrete Poles.

UNIT V

CONTINUOUS BEAMS: Advantage of Continuous Members – Effect of Prestressing Inderterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon's Theorem. Redistribution of moments in a continuous beam.

Anchorage Zone Stresses in Beams: Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel's method- Guyon's Method - Anchorage zone Reinforcement.

Reference Books:

1. PrestressedConcretebyKrishnaRaju–FifthEdition-TataMcGrawHillBook–Co., New Delhi.
2. Design of Prestress Concrete Structures by T.Y.LinandBurn, John Wiley,NewYork.
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House
4. IS1343-2012, Prestressed Concrete–Code of Practice, Bureau of Indian Standards.
5. PrestressedConcrete:AnalysisandDesignPracticebyKarunaMoyGhosh,Prentice Hall of India

Course Outcomes:

After the completion of this course, the students should be able to

CO1To understand principles of pre-stressing, including materials systems of pre- stressing, structural behaviour, advantages, losses of pre-stress.

CO 2Analyze and design prestressed flexure members, horizontal and vertical shear in prestressed members

CO 3Study the behaviour of composite constructions under prestressing

CO 4Realize importance of prestessing long span structures and heavily loaded members..

CO 5Develop skills in planning, analysis and design of prestressed concrete beams and slabs.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE07)ADVANCED COMPUTING LABORATORY

M. TECH-II Semester **L/T/P/C**
0/0 /4 /2

List of Experiments:

1. FEM – Preprocessing: Element Type, Material/ Geometric properties, Modeling, Mesh Generation – Solution: Loads, Constraints – Post Processing
2. FEM Analysis of RCC Beam – Column – Slab.
3. Finite Element Modelling and Analysis of Plane frame and Space frame.
4. Analysis of Pre-stressed concrete elements through Finite Element Modeling.
5. Finite Element Analysis of truss member
6. Buckling analysis of steel member using FEM tool
7. Finite Element Modelling and Analysis of Bridge Structure.
8. Dynamic Analysis of Structure Subjected to Seismic Load.
9. Analysis of Retaining wall in Geotechnical module.
10. Finite Element Modelling and Analysis of water storage tanks

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Gain knowledge about modelling, analysis and designing of RCC elements using FEM tool.

CO 2Design pre-stressed concrete elements using FEM.

CO 3Able to analyze steel member and bridge structure using FEM analysis.

CO 4Gain knowledge on response of dynamic analysis of structure

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE08) NUMERICAL ANALYSIS LABORATORY

M. TECH- II Semester **L/T/P/C**
0/0 /4 /2

Syllabus Contents:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jorden Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations by Euler's Method.
10. Numerical Solution of Ordinary Differential Equations by Runge- Kutta Method.

Course Outcomes:
After the completion of this course, the students should be able to

CO 1 Obtain Roots of non-linear equations by Bisection method and Newton's method.
CO 2 Perform calculations on system of Linear Equations using Gauss – Elimination/ Gauss - Seidal Iteration/ Gauss - Jorden Method
CO 3 Integrate Numerically Using Trapezoidal and Simpson's Rules
CO 4 Evaluate Numerical Solution of Ordinary Differential Equations by Euler's Method and Runge- Kutta Method

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE09) SEMINAR

M. TECH- II Semester **L/T/P/C**
0/0 /4 /2

SYLLABUS:

There is no specific syllabus for this course. Student can choose any topic, of his choice, pertaining to Engineering Structures. Topic should be a relevant and currently researched one.

Students are advised to refer articles published in current journals in the area of Structural Engineering for choosing their seminar topics. Student should review minimum of 10 to 15 research papers relevant to the topic chosen, in addition to standard textbooks, codebooks, etc.

Students are required to prepare a seminar report, in the standard format and give presentation to the Seminar Assessment Committee (SAC) in the presence of their classmates. It is mandatory for all the students to attend the presentations of their classmates.

Reference:

1. Referred Structural Engineering Journals like ASCE, ACI, C& CR, CBM, C&CC etc.,
2. Research Articles / Reports available on Internet.
3. Standard Structural Engineering Textbooks, Handbooks and Codebooks.

Course Outcomes:

After the completion of this course, the students should be able to
CO 1Gain knowledge in current trends of research problems.
CO 2Review research papers
CO 3Present the recent topics
CO 4Write detailed report on current journal papers

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20AC01) ENGLISH FOR SCIENTIFIC COMMUNICATION

M. TECH- II Semester **L/T/P/C**
2/0 /4 /0

UNIT I:
ESSENTIAL COMMUNICATION : Verbal communication – Effective communication – Active Listening – Paraphrasing – Feedback, Non Verbal Communication – Body language of self and Others, Important of feelings in communication – Dealing with feelings in communication practice – Exercise

UNIT II:
ACADEMIC WRITING: What is Research? - Meaning & Definition of a research paper– Purpose of a research paper – Scope – Benefits – Limitations – outcomes
RESEARCH FORMAT: Title – Abstract – Introduction – Discussion - Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT III:
RESEARCH METHODOLOGY: Methods (Qualitative – Quantitative) – Literature Review – Who did what – Criticizing, Paraphrasing & Plagiarism.

UNIT IV:
PROCESS OF WRITING A RESEARCH PAPER: Choosing a topic - Thesis Statement – Outline – Organizing notes - Language of Research – Word order, Paragraphs – Writing first draft – Revising/Editing - Typing the final draft

UNIT V:
HOW TO & WHERE TO GET PUBLISHED: Reputed Journals – National/International – ISSN No, No. of volumes, Scopes Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits

Reference Books:

1. MLA Hand book for writers of Research Papers, East West Press Pvt. Ltd, New Delhi, 7th Edition.
2. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4th Edition.
3. LauriRozakis, Schaum's Quick Guide to Writing Great Research Papers, Tata McGraw Hills Pvt. Ltd, New Delhi.
4. N. Gurumani, Scientific Thesis Writing and Paper Presentation, MJP Publishers

Course Outcomes:
After the completion of this course, the students should be able to
CO 1Understand the varies of technical communication.
CO 2Understand the formatting of a research paper.
CO 3Write a paper for publication in a standard journal.
CO 4Work on citations and ably place them in his/her research work.
CO 5Understand the importance of plagiarism and how to avoid the same.

******

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE24) DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES
(Elective – V)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT I
Principles of analysis and design of Industrial buildings and bents - Crane gantry girders and crane columns - Analysis and design of steel towers - Design of industrial stacks - Self supporting and guyed stacks lined and unlined.

UNIT II
Types of connections, Design of framed beam connections, Seated beam connection, Un- stiffened, Stiffened Seat connections, Continuous beam – to - beam connections and continuous beam–to–column connection both welded and bolted.

UNIT III
Cold formed Steel Sections - Types of cross sections - Local buckling and post buckling - Design of compression and Tension members - Beams - Deflection of beams - Combined stresses and connections.

UNIT IV
Introduction to composite design – shear connectors – types of shear connectors – degrees of shear connections
– partial and full shear connections – composite sections under positive bending – negative bending – propped conditions – un-propped conditions – deflection of composite beams.

UNIT V
Introduction – Composite slabs – profiled sheeting – sheeting parallel and o span – sheeting perpendicular to span - Types of Composite columns – design of encased columns – design of in-filled columns uni-axial and bi-axially loaded columns. Composite shear wall – double skinned composite deck panels – composite trusses – composite frames – composite plate girders.

Reference Books:
1. Arya, A.S., Design of Steel Structures, New Chand & Brothers, New Delhi1982.
2. R.P. Johnson, “Composite Structures of Steel & Concrete”, Blackwell Scientific publications, UK,1994.
3. Necessary Indian & Euro codes.

Course Outcomes:
After the completion of this course, the students should be able to
CO 1Understand principles of industrial buildings and towers.
CO 2Design different type of connections welded and bolted.
CO 3Analysis concepts of cold formed steel connections
CO 4Understand concept of steel-concrete composite construction
CO 5Understand the behaviour of steel concrete composite structures

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE25) OFFSHORE UNDERWATER CONSTRUCTTION
(Elective – V)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT-I
Introduction- site preparation- temporary roads - site drainage-deep trench and deep basement excavations – bulk excavation.

UNIT-II
Coastal structures - stability of slopes to open excavations - support of excavation by timbering and sheet piling.

UNIT-III
Offshore platforms - retaining walls and sheet pile design - requirements for shoring and underpinning - methods of shoring and underpinning.

UNIT-IV
Dewatering and Groundwater Control for Soft Ground Tunneling - Tunneling in touch, medium- tough and soft rocks - tunneling by boris shield tunneling

UNIT-V
Deep water foundations - Design of piles - pile load tests - Foundation design for dynamic conditions.

Reference Books:

1. BenC.GerwickJr., “Construction of Marine and Offshore Structures”,3rd edition. CRC Press, 2007.
2. PatrickPowers.J., “Construction Dewatering: New Methods and Applications”, John Wiley and Sons,1992
3. D.A. Ardus, D. Clare, A. Hill · “Offshore Site Investigation and Foundation Behaviour” Springer, 2013
4. J. S. Templeton, Alan G. Young, Joseph Kallaby · “Offshore Technology in Civil Engineering ” ASCE, 2010

Course Outcomes:
After the completion of this course, the students should be able to

CO 1Understand problems involved in site preparation including drainage and shoring.

CO 2Understand the concepts of stability of slopes in open excavations.

CO 3Perform analysis of retaining wall and sheet pile design.

CO 4Make use of underwater tunnelling techniques in practical applications.

CO 5Obtain knowledge on underwater foundation for structures.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE26) EARTHQUAKE ANALYSIS AND DESIGN OF STRUCTURES
(Elective – V)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT I Earthquakes and Ground Motion
Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon), Seismo tectonics and Seismic Zoning of India, Earthquake Monitoring and Seismic Instrumentation, Characteristics of Strong Earthquake Motion, Estimation of Earthquake Parameters, Micro zonation.

UNIT II Effects of Earthquake on Structures
Dynamics of Structures (SDOFS/ MDOFS), Response Spectra - Evaluation of Earthquake Forces as per codal provisions - Effect of Earthquake on Different Types of Structures - Lessons Learnt From Past Earthquakes

UNIT III Earthquake Resistant Design of Masonry Structures
Structural Systems - Types of Buildings - Causes of damage - Planning Considerations - Philosophy and Principle of Earthquake Resistant Design - Guidelines for Earthquake Resistant Design - Earthquake Resistant Masonry Buildings - Design consideration – Guidelines.

UNIT IV Earthquake Resistant Design of RC Structures
Earthquake Resistant Design of R.C.C. Buildings - Material properties - Lateral load analysis – Capacity based Design and detailing – Rigid Frames – Shear walls.

UNIT V Vibration Control Techniques
Vibration Control - Tuned Mass Dampers – Principles and application, Basic Concept of Seismic Base Isolation
– various Systems- Case Studies, Important structures.

Reference Books:

1. Bruce A Bolt, “Earthquakes” W H Freeman and Company, New York, 2004.
2. C. A. Brebbia,"Earthquake Resistant Engineering Structures VIII”,WIT Press,2011
3. Mohiuddin Ali Khan “Earthquake-Resistant Structures: Design, Build and Retrofit”, Elsevier Science & Technology,2012
4. Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”, Prentice Hall of India,2009.
5. Paulay,T and Priestley, M.J.N., “Seismic Design of Reinforced Concrete and Masonry buildings”, John Wiley and Sons,1992.
6. S K Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press,2007.

Course Outcomes:
After the completion of this course, the students should be able to
CO 1Understand the basics of earthquake engineering and how they influence the structural design.
CO 2Predict the sources of earthquakes understanding seismology and conceptually design the buildings
CO 3Apply basic methods employed for analysis of civil engineering problems involving dynamics and earthquake.
CO 4Access seismic performance of non-structural and structural components and identify effective measures to mitigate potential damage.
CO 5Understand principles of vibration control technique including TMD, Base isolation technique etc.,

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20MB22)BUSINESS LAW AND ETHICS
(Open Elective)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT I

Companies Act, 2013: Steps and procedure for incorporation of the company, Appointment ofDirectors, Powers, duties, & liabilities of Directors, Company Meetings, Resolutions, Winding-up of a Company.

UNIT – II:

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT – III:

Negotiable Instruments Act - 1881: Negotiable Instruments- Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics, Types of endorsements, Holder- Holder in due course, Discharge of Parties. Introduction to Goods and Services Tax (GST).

UNIT – IV:

Business Ethics: The Changing Environment: Business Ethics-why does it matter? ; Levels of Business Ethics- Five Myths about Business Ethics- can Business Ethics be taught and trained? : stages of Moral development Kohlberg's study-carol Gilligan's Theory-Principles of Ethics.

UNIT – V:

Cyber Crime: The Legal Landscape - Need for cyber laws in the Indian context - The Indian IT Act-challenges to Indian Law and cyber crime scenario in Indian – issues and Challenges in Cyber Crime.

ReferenceBooks:

1. Ravinder Kumar, Legal Aspects of Business, 4th edition,Cengage Learning, 2016.
2. P.P.S.Gogna, Company Law, S.Chand, 2016.
3. RSN Pillai, Bagavathi, Legal Aspects of Business, S.Chand, 2016.
4. Akhileshwar Pathak , Legal Aspects of Business, Tata McGraw Hill, 3e, 2011.
5. Nina Godbole & SunitBelapure, Cyber Security, Wiley India, 2012.

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Understand company act.
CO 2Understand importance of labor contract
CO 3Understand billings act and legal aspects.
CO 4Understand the business ethics.
CO 5Understand Indian IT act and issues in cyber crime

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20MB30)PROJECT MANAGEMENT
(Open Elective)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT - I:

Introduction: Introduction to Project management –Project Characteristics- Project Life cycle –Project Identification, Formulation and Implementation- Project management in different sectors: Construction, Services Sector, Public sector and Government Projects. Systems approach to project management.

UNIT - II:

Project Planning and Appraisal: Project Planning – Project Appraisal- Feasibility study- Technical, Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

UNIT - III:

Project Finance : Project Cost Estimation, Project Financing- Investment Criteria, Project Evaluation Techniques- Pay Back Period, Accounting rate of return, Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects- Cost of Capital, Risk Analysis.

UNIT - IV:

Project Planning and Control: Planning Steps- Scheduling- Network Diagrams, Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management.

UNIT - V:

Organizational Behavior and Project Management: Organizational Structure and Integration, Role of project manager, Roles in the project team, Project stakeholder engagement, Leadership in project management, participative management, team building approach, Conflict Management in Projects, Stress Management.

Reference Books:

1. John M, Nicholas and Herman Steyn, Project Management for Engineering, Business, and Technology, 5e, Routledge, 2017.
2. Prasanna Chandra, Projects, Planning, Analysis, Selection, Financing, Implementation, and review, 6e, Tata McGraw Hill 2008.
3. K. Nagrajan, Project Management, New Age International Publishers, 7e 2015.
4. Jack Gido, Jim Clements Rose Baker, Successful Project Management, Cengage Learning, 7e 2015.
5. R. Paneerselvam, P. Senthil Kumar, Project Management, PHI, 2009.

Course Outcomes:

After the completion of this course, the students should be able to understand

CO 1Importance of Project Management

CO 2Concepts of project planning, execution and implementation

CO 3Basics of project financing , cash flow estimation etc.,

CO 4Scheduling involved in project planning and execution

CO 5Organizational structure and project management

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20MA01) ADVANCED MATHEMATICAL MODELLING
(Open Elective)

M. TECH- III Semester **L/T/P/C**
3/0 /0 /3

UNIT- I Single Variable Non-Linear Unconstrained Optimization: One dimensional Optimization methods:- Uni-modal function, elimination methods, Fibonacci method, golden section method, interpolation methods – quadratic & cubic interpolation methods.

UNIT-II Multi variable non-linear unconstrained optimization: Direct search method – Univariant method - pattern search methods – Powell's- Hook -Jeeves, Rosenbrock search methods- gradient methods, gradient of function, steepest decent method, Fletcher Reeves method, variable metric method.

UNIT- III Linear Programming: Formulation – Sensitivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction – Types- steps – application – inventory – queuing systems

UNIT -IV Integer Programming: Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method Stochastic programming: Basic concepts of probability theory, random variables- distributions-mean, variance, correlation, co variance, joint probability distribution-stochastic linear, dynamic programming.

UNIT- V Geometric Programming: Polynomials – arithmetic - geometric inequality – unconstrained G.P constrained G.P (<= TYPE ONLY) Non-traditional optimization Techniques: Genetic Algorithms-Steps-Solving simple problems - Comparison of similarities and dissimilarities between traditional and non-traditional techniques Particle Swarm Optimization (PSO)- Steps(Just understanding)-Simulated Annealing-Steps-Simple problems.

Reference Books:

1 Optimization theory & Applications / S.S. Rao / New Age International.
2 Engineering Optimization-Kalyan Deb/ PHI
3 Operation Research / H.A. Taha /TMH
4 Optimization in operations research / R.L Rardin 8. Optimization Techniques /Benugundu&Chandraputla / Pearson Asia

Course Outcomes:

After the completion of this course, the students should be able to

CO 1Understand basic principles of optimization.

CO 2Formulate optimization models for a wide range of civil engineering problems.

CO 3Perform sensitive analysis for various engineering problems.

CO 4Understand concept of probability theory and estimate correlation coefficient for experimental data.

CO 5Perform various traditional optimization techniques for civil engineering applications.

*****

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE10) DISSERTATION PHASE - I

M. TECH- III Semester **L/T/P/C**
0/0/20/10

SYLLABUS:

The student works on a specific topic approved by faculty member after due consulting and discussion in a mutual area of interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

Course Outcomes:

At the end of the course the students will have a clear idea of his/her area of work and they will be in a position to carry out the remaining Phase II work in a systematic way.

VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)

(M20SE11) DISSERTATION PHASE - II

M. TECH- IV Semester **L/T/P/C**
0/0/32/16

SYLLABUS:

The student will continue the Phase I work on the selected topic as per the formulated in Phase I. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated based on the report and the viva-voce examination by a panel of examiners including one external examiner.

Course Outcomes:

On completion of the project work the students will be in a position to take up any challenging problem and find an appropriate solutions.

*****