JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D35101	Theory of Elasticity	PC	3	0	0	3
2.	21D35102	Matrix Methods of Structural Analysis	PC	3	0	0	3
3.	21DBS103 21D35103a 21D35103b	**Program Elective Course - I** Computer Aided Numerical Methods Optimization in Structural Design Structural Health Monitoring	PE	3	0	0	3
4.	21D35104a 21D35104b 21D35104c	**Program Elective Course – II** C++ and Data Structures Design of Prestressed Concrete Modeling Simulation and Computer Applications	PE	3	0	0	3
5.	21D35105	CAD Laboratory- I	PC	0	0	4	2
6.	21D35106	Advanced Structural Engineering Laboratory	PC	0	0	4	2
7.	21DRM101	Research Methodology and IPR	MC	2	0	0	2
8.	21DAC101a 21DAC101b 21DAC101c	**Audit Course – I** English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	AC	2	0	0	0
Total							**18**

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SEMESTER – II

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D35201	Structural Dynamics	PC	3	0	0	3
2.	21D35202	Finite Element Analysis	PC	3	0	0	3
3.	21D35203a 21D35203b 21D35203c	**Program Elective Course – III** Artificial Neural Networks Theory and Analysis of Plates and Shells Reliability Based Engineering Design	PE	3	0	0	3
4.	21D21103a 21D35204a 21D35204b	**Program Elective Course – IV** Advanced Concrete Technology Stability of Structures Fracture Mechanics	PE	3	0	0	3
5.	21D35205	CAD Laboratory-II	PC	0	0	4	2
6.	21D35206	Advanced Concrete Laboratory	PC	0	0	4	2
7.	21D35207	Technical seminar	PR	0	0	4	2
8.	21DAC201a 21DAC201b 21DAC201c	**Audit Course – II** Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							**18**

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SEMSTER - III

S.No.	Course codes	Course Name	Category	Hours per			Credits
					T	P	
1.	21D35301a 21D35301b 21D35301c	**Program Elective Course – V** Earthquake Resistant Design of Buildings CAD and Computer Applications in Structural Engineering Management Information Systems	PE	3	0	0	3
2.	21DOE301a 21DOE301b 21DOE301c	**Open Elective** Cost Management of Engineering Project Industrial Safety Business Analytics	OE	3	0	0	3
3.	21D35302	Dissertation Phase – I	PR	0	0	20	10
4.	21D35303	Co-curricular Activities					2
		Total					**18**

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D35401	Dissertation Phase – II	PR	0	0	32	16
Total							**16**

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COURSE STRUCTURE & SYLLABI

Course Code	THEORY OF ELASTICITY	L	T	P	C
21D35101		3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- To make students understand the principles of elasticity.
- To familiarize students with basic equations of elasticity.
- To expose students to two dimensional problems in cartesian and polar coordinates.
- To make students understand the principle of torsion of prismatic bars.

Course Outcomes (CO): Student will be able to

- Apply elastic analysis to study the fracture mechanics.
- Apply linear elasticity in the design and analysis of structures such as beams, plates, shells and sandwich composites.
- Apply hyper elasticity to determine the response of elastomer-based objects.
- Analyze the structural sections subjected to torsion.

UNIT - I		Lecture Hrs:10

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.

UNIT - II		Lecture Hrs:10

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.

UNIT - III		Lecture Hrs:10

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.

UNIT - IV		Lecture Hrs:9

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.

UNIT - V		Lecture Hrs:9

TORSION OF PRISMATIC 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 and Bars.
Textbooks:
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.
Reference Books:
1. Plasticity for structural Engineers- Chen, W.F. and Han, D.J., Springer – Verlag, New York. 2. Plasticity theory, Lubliner, J., Mac Millan Publishing Co., New York. 3. Foundations of Solid Mechanics by Y.C.Fung, PHI Publications. 4. Advanced Mechanics of Solids by L.S. Srinath, Tata MC Graw Hill Book company.

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Course Code	MATRIX METHOD OF STRUCTURAL ANALYSIS	L	T	P	C
21D35102		3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- To understand the static and kinematic indeterminacy of the structures
- To understand the concepts of matrix methods of analysis of structures
- To understand the analysis of continuous beams.
- To understand the analysis of rigid and pin jointed frames

Course Outcomes (CO): Student will be able to

- Distinguish determinate and indeterminate structures.
- Identify the method of analysis for indeterminate structures.
- Apply matrix methods of analysis for continuous beams.
- Apply matrix methods of analysis for rigid and pin jointed frames.

UNIT - I		Lecture Hrs:10

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.

UNIT - II		Lecture Hrs:10

ANALYSIS OF CONTINUOUS BEAMS- Stiffness Method and Flexibility Method of Analysis – Continuous Beams of Two and Three Spans With Different End Conditions-Internal Hinges.

UNIT - III		Lecture Hrs:10

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.

UNIT - IV		Lecture Hrs:9

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.

UNIT - V		Lecture Hrs:9

EQUATION SOLVERS-Solution of System of Linear Algebraic Equations-Direct Inversion Method-Gauss Elimination Method-Cholesky Method-Banded Equation Solvers-Frontal Solution Technique.

Textbooks:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Matrix method of S.A by Pandit & Gupta

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Reference Books:
1. Matrix Structural Analysis by Madhu B. Kanchi. 2. Matrix Methods of Structural Analysis by J.Meek. 3. Structural Analysis by Ghali and Neyveli. 4. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

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COURSE STRUCTURE & SYLLABI

Course Code	COMPUTER AIDED NUMERICAL METHODS	L	T	P	C
21DBS103	(PEC-I)	3	0	0	3
	Semester	I			

Course Objectives: This Course will enable students:

- To familiarize with numerical methods of solving the non-linear equations, integration, and partial differential equations.
- To impart knowledge in basic concepts of finite element methods and applications.

Course Outcomes (CO): Student will be able

- To solve nonlinear algebraic equations numerically.
- To solve simultaneous linear equations numerically.
- To numerically integrate continuous and discrete functions.
- To numerically solve ordinary and partial differential equations that are initial value or boundary value problems.

UNIT - I	Solution of Non-Linear Equations & Numerical Integration	Lecture Hrs: 8

Solution of Non-Linear Equations: Newton - Raphson Method, Von - Mises Formula, Chord's Method, Bisection Method- Comparative Study-Solution of Cubic Equation and Quadratic 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 & Boundary Value Problems And Characteristics Value Problems	Lecture Hrs: 10

Solution of System of Equations: Gauss Elimination Method- Gauss-Jordan Method- LU 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	Lecture Hrs: 8

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	Lecture Hrs: 8

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	Lecture Hrs: 8

Finite Element Method: **Finite Element Method** – Weighted residual methods, least square method, Gelarkin's method – Finite Elements – Interpolating over the whole Domain – one dimensional case, two dimensional case

Textbooks:

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.

Reference Books:

1. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI Publication
2. Douglas J. Faires, Richard Burden "Numerical Methods" Brooks/Cole publishing company,1998.
3. Introduction to Finite Element Engineering, T.R.Chandrupatla and A.D. Belagundu
4. C Language And Numerical Methods By C. Xavier-New Age International Publishers.
5. Numerical Methods for Scientific and Engineering Computation; M.K.Jain, S.R.K.Iyengar, R.K.jain

Online Learning Resources:

After completion of this course the student should be able to :

1. Understand the concepts and steps of Numerical methods
2. Find the solution and implementation of non linear equations.
3. Solve the initial and boundary value problems numerically.
4. Solve the 1-D and 2-D problems using finite element method.
5. Identify, formulate and solve structural engineering problems.

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Course Code	OPTIMIZATION IN STRUCTURAL DESIGN	L	T	P	C
21D35103a	(PE-I)	3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- Learn the different optimization methodologies applied to structural systems and linear optimization.
- Understand the dynamic programming, decision theory and simulations.
- Assess the different optimization methodologies applied to structural systems
- To apply optimum principles to achieve economical structural systems.

Course Outcomes (CO): Student will be able to

- Explain the requirement of optimization specific to structural systems.
- Enumerate the various conventional techniques available for structural optimization.
- Explain about various programming techniques adapted for structural optimization.
- Illustrate the design optimization for Reinforced concrete structures.
- Illustrate the design optimization for Reinforced concrete beams.

UNIT - I	Lecture Hrs:10

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.

UNIT - II	Lecture Hrs:10

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.

UNIT - III	Lecture Hrs:10

Simplex Method. – Revised Simplex Method, Duality of Linear Programming Sensitivity Or Post Optimality Analysis.

UNIT - IV	Lecture Hrs:9

Optimization By Structural Theorems. Maxwell Mitchell and Heymans Theorem for Structures and Frames.

UNIT - V	Lecture Hrs:9

Optimization Techniques Applied to Fully Stressed Design With Deflection Constraints, Optimality Criterion Methods.

Textbooks:

1. Optimum Structural Design, Civil Engineering and Engineering Mechanics Services, Spunt, Prentice Hall New Jersey, 1971.
2. Optimization Theory and Applications, S.S.Rao, Wiley Eastern Limited, New Delhi, 1977.
3. Optimum Structural Design , Uri Krisch, Mc Graw Hill Book Co., 1981.

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Reference Books:

1. Operations Research, Richard Bronson, Schaums, Outline Series, Mc Graw Hill Book Company, Singapore 1983.
2. Introduction to Optimum Design, J.S.Arora, Mc Graw Hill Book Company, New Your, 1989.
3. Foundations of Structural Optimization – A Unified Approach, A.J. Morris (Editor) John Wiley and Sons, Chichester, 1982.

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COURSE STRUCTURE & SYLLABI

Course Code	STRUCTURAL HEALTH MONITORING	L	T	P	C
21D35103b	(PE-I)	3	0	0	3
	Semester	**I**			

Course Objectives: This course will enable students:

- To understand the structural health monitoring for structures.
- To understand the conditional assessment & techniques for strengthening and retrofitting of structures.

Course Outcomes (CO): Student will be able to

- Diagnose the distress in the structure by understanding the causes and factors
- Assess the health of structure using static field methods.
- Assess the health of structure using dynamic field tests
- Carryout repairs and rehabilitation measures of the structure

UNIT - I	Lecture Hrs:10

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	Lecture Hrs:10

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	Lecture Hrs:10

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	Lecture Hrs:9

Condition Survey & NDE of Concrete Structure:

a) Definition and Objective of Condition Survey, Stages of Condition Survey (Preliminary, Planning, Inspection and Testing Stages)

b) 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	Lecture Hrs:9

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.
Textbooks:
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. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang
Reference Books:
1. Hand Book On "Repair and Rehabilitation of Rcc Buildings", Published By Director General, Cpwd, Govt. of India, 2002. 2. Hand Book On Seismic Retrofitting of Buildings, Published By Cpwd & Indian Building Congress in Association With Iit, Madras, Narosa Publishing House, 2008 3. Smart Materials and Structures, Gandhi and Thompson

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Course Code	C++ AND DATA STRUCTURES	L	T	P	C
21D35104a	(PE-II)	3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- With programming (with an emphasis on problem solving) and introduce elementary data structures.
- To prove correctness (loop invariants, conditioning, etc) and analyze efficiency (using the `O' notation).

Course Outcomes (CO): Student will be able to

- Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs.

UNIT - I	Lecture Hrs:10

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 Constructiors, Copy Constructor, Destructors, Inheritance – Single, Multilevel, Multiple, Hierarchical, Hybrid, Parameter Passing Methods.

UNIT - II	Lecture Hrs:10

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

UNIT - III	Lecture Hrs:

Linked Lists :- Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked, Insertion in to and Deletion from Linked List.

UNIT - IV	Lecture Hrs:9

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	Lecture Hrs:9

Trees :- Binary Trees, Representing Binary Trees in Memory, Operations On Binary Trees, Types of Trees.

Textbooks:

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.

Reference Books:

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1. Data Structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia andMount, 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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Course Code	DESIGN OF PRESTRESSED CONCRETE	L	T	P	C
21D35104b	(PE-II)	3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- Familiarize students with concept of pressurising and analysis of priestess
- Design and analysis of pretension and post tensioned concrete members
- Determination of deflections of pressurised members
- To calculate the losses of priestess, creep and shrinkage.

Course Outcomes (CO): Student will be able to

- To understand the basic concepts about pressurised concrete and analysis of priestess
- Estimate the effective losses in priestess
- Analyse the effect of pressurising force in the behaviour of beams in flexure
- To design shear, torsion and transmission length in pressurised concrete members
- Design of compression and tension members as per codes of practice

UNIT - I	Lecture Hrs:10

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.

UNIT - II	Lecture Hrs:10

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 and Friction.

UNIT - III	Lecture Hrs:10

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.

UNIT - IV	Lecture Hrs:9

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.

UNIT - V	Lecture Hrs:9

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.

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Textbooks:
1. Prestressed Concrete by N. Krishna Raju, TMH Pubilishers. 2. Prestressed Concrete by K.U.Muthu, I.K. International Publishing House. 3. Prestressed Concrete Design By Praveen Nagarajan, Pearson Pubilications.
Reference Books:
1. Design of Prestressed Concrete Structures, T.Y.Lin, Asian Publishing House, Bombay, 1953. 2. Prestressed Concrete, Vol.I&II, Y.Guyon, Wiley and Sons, 1960. 3. Prestressed Concrete Design and Construction, F.Leohhardt, Wilhelm Ernst and Shon, Berlin, 1964. 4. Reinforced concrete designers hand bood, A view point publication, C.E.Reynolds and J.C. Steedman, 1989. 5. Prestressed Concrete, Edward P.Nawy, Prentice Hall –. 6. Prestressed Concrete – by Raj Gopal, Narosa Pubilications.

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Course Code	MODELLING SIMULATION AND COMPUTER APPLICATIONS (PE-II)	L	T	P	C
21D35104c		3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- Define the basics of simulation modeling and replicating the practical situations in organizations
- Generate random numbers and random variates using different techniques.
- Develop simulation model using heuristic methods.
- Analysis of Simulation models using input analyzer, and output analyzer
- Explain Verification and Validation of simulation model.

Course Outcomes (CO): Student will be able to

- Describe the role of important elements of discrete event simulation and modeling paradigm.
- Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
- Develop skills to apply simulation software to construct and execute goal-driven system models.
- Interpret the model and apply the results to resolve critical issues in a real world environment.

UNIT - I	Lecture Hrs:10

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.

UNIT - II	Lecture Hrs:10

CONTINUOUS SYSTEM SIMULATION: Numeric Solution of Differential Equations, Analog Computers, Hybrid Computers, Continuous System Simulation Languages CSMP, System Dynamic Growth Models, Logistic Curves.

UNIT - III	Lecture Hrs:10

PROBABILITY CONCEPTS IN SIMULATION: Monte Carlo Techniques, Stochastic Variables, Probability Functions, Random Number Generation Algorithms.

UNIT - IV	Lecture Hrs:9

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.

UNIT - V	Lecture Hrs:9

GPSS & SIMSCRIPT, PROGRAMMING IN GPSS: Simulation Programming Techniques: Data Structures, Implementation of Activities, Events and Queues, Event Scanning, Simulation Algorithms in GPSS and SIMSCRIPT.

Textbooks:

1. System Simulation, Geoffrey Gordon: PHI.
2. Computer Simulation Experiments With Models of Economic Systems, Naylor, Thomas, H

John Wiley and Sons, 1971.

3. Discrete Event system Simulation, Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol, Pearson Education,

Reference Books:

1. Introduction to Urban Dynamics, Louis Wdward Alfeld and Alan K.Graham, Wright – Allen Press Inc., Massachusetts, 1976.
2. Models in Geography, Richard J.Chorley and Peter Haggett, Methuen & Co.Ltd., 1977.
3. Operations Research – An Introduction, Hamdy A.Taha, Macmillan Company, New York, 1987.
4. Environmental Facilities and Urban Development in India-A System Dynamic Model for Developing Countries, Thirumurthy.A.M. Academic Foundations, India.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	CAD LABORATORY I	L	T	P	C
21D35105		0	0	4	2
	Semester	I			

Course Objectives: The students will acquire knowledge about

- Demonstrate the design of reinforced concrete structural elements.
- Explain earthquake resistant design
- Explain analysis of a building for wind loading.
- Demonstrate the method of analysis of truss.

Course Outcomes (CO): At the end of the course, students will be able to:

- Analyze and design the structural components like beams, slabs and columns,
- Analyze and design retaining wall and shear wall.
- Analyze for earthquake loading & wind loading of framed buildings.
- Analyze and design pin jointed, rigid jointed plane structures.

List of Experiments:

1. Design of reinforced concrete beam (singly/doubly)
2. Design of reinforced concrete column subjected to biaxial bending
3. Design of reinforced concrete slab (One way/Two-way)
4. Design of reinforced concrete retaining wall (cantilever type)
5. Design of reinforced concrete shear wall
6. Lateral forces on a building due to an earthquake using equivalent static method
7. Lateral forces on a building due to wind
8. Analysis of rigid jointed plane frames
9. Analysis of simply supported/cantilever beam
10. Analysis of plane truss Design of Steel Tension Members.

References:

1. T.S Sarma,Staad Pro V8i for Beginners,Notion Press; (2014).
2. Sham Tickoo, Learning Bentley Staad.Pro V8i for Structural Analysis,Dreamtech press (2015).
3. Technical Reference Manual for Staad, Bentley

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED STRUCTURAL ENGINEERING LABORATORY	L	T	P	C
21D35106		0	0	4	2
	Semester	I			

Course Objectives: The students will acquire knowledge about

- Design of experiments,
- To investigate the performance of structural elements.
- To evaluate the different testing methods and equipments.

Course Outcomes (CO): At the end of the course, students will be able to:

- Achieve Knowledge of design and development of experimenting skills.
- Understand the principles of design of experiments
- Design and Develop analytical skills.
- Summarize the testing methods and equipments.

List of Experiments

1. Load deflection characteristics of under reinforced concrete beam.
2. Load Deflection characteristics of over reinforced concrete beam.
3. Comparison of reinforced concrete beam with and without shear reinforcement.
4. Detection of reinforcement in structural members using profometer.
5. Temperature effects on compressive strength of concrete.
6. Impact strength of concrete beam.
7. Testing of Brick masonry wall.
8. Load deflection characteristics of reinforced concrete beam under cyclic loading using 500kN actuator.
9. Load deflection characteristics of reinforced concrete column under cyclic loading using 1000kN actuator.
10. Load deflection characteristics of reinforced concrete beam under torsion.
11. Ambient Vibration Testing.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
21DRM101		2	0	0	2
	Semester	I			

Course Objectives:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

Course Outcomes (CO): Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I		Lecture Hrs:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II		Lecture Hrs:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT - III		Lecture Hrs:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - IV		Lecture Hrs:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT - V		

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Textbooks:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	STRUCTURAL DYNAMICS	L	T	P	C
21D35201		3	0	0	3
	Semester	**II**			

Course Objectives: This course will enable students:

- Determine vibration characteristics of structures like frequency, amplitude, impedence and time period
- Differentiate the response of single and multi degree of freedom systems
- Determine the response of structures for pulse excitation like blast load
- Differentiate the response of Multi Degree of Freedom systems

Course Outcomes (CO): Student will be able to

- Write equation of motion for single and multi degree of freedom systems
- Understand the impact of damping on charecterstics of vibrating system
- Gain Knowledge about arbitary and pulse excitation
- Understand applications of Numerical methods in dynamics
- Analyse in various theories of failure and plasticity

UNIT - I	Lecture Hrs:10

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.

UNIT - II	Lecture Hrs:10

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

UNIT - III	Lecture Hrs:10

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

UNIT - IV	Lecture Hrs:9

PRACTICAL VIBRATION ANALYSIS: Stodola Method- Fundamental Mode Analysis –Analysis of Second and Higher Modes –Holzer's Method –Basic Procedure –Transfer Matrix Procedure

UNIT - V	Lecture Hrs:9

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-

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Principles of Application to Continuous Beams.
Textbooks:
1. Structural Dynamics for Earthquake Engineering,A.K.Chopra,Pearson Pubilications 2. Dynamics of Structures by Clough & Penziem 3. Structural Dynamics by Roy. R. Craig John willy & fours.
Reference Books:
1. Structural Dynamics by Mario Paz 2. I.S:1893(Latest)“ Code of Practice for Earthquakes Resistant Design of Stuctures” 3. Fundamentals of Vibration, Anderson R.A, Amerind Pulblishing Co.,1972.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	FINITE ELEMENT METHODS FOR STRUCTURAL ENGINEERING	L	T	P	C
21D35202		3	0	0	3
	Semester	II			

Course Objectives: This course will enable students:

- To provide an overview and basic fundamentals of Finite Element Analysis.
- To introduce basic aspects of finite element theory, including domain discretization, interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
- To explain the underlying concepts behind variational methods and weighted residual methods in FEM.
- Formulate simple structural problems in to finite elements

Course Outcomes (CO): Student will be able to

- Analyse and build FEA models for various Engineering problems.
- Able to identify information requirements and sources for analysis , design and evaluation
- Use professional-level finite element software to solve engineering problems.
- Interpret results obtained from FEA software solutions, not only in terms of conclusions but also awareness of limitations.

UNIT - I	Lecture Hrs:10

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

UNIT - II	Lecture Hrs:10

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.

UNIT - III	Lecture Hrs:10

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.

UNIT - IV	Lecture Hrs:9

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.

UNIT - V	Lecture Hrs:9

THREE DIMENSIONAL FEM-Different 3-D Elements, 3D Strain –Displacement Relationship-Formulation of Hexahedral and Isoparametric Solid Element.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
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Textbooks:

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
3. Finite Elements Methods in Engineering By Tirupati. R. Chandrnpatla, Universities Press India Ltd. Hyderabad.

Reference Books:

1. Finite Element Method and Its Application By Desai ,2012, Pearson Pubilications.
2. Finite Element Methods By Darrel W.Pepper, Vikas Pubilishers
3. Finite Element Analysis and Procedures in Engineering By H.V.Lakshminaryana, 3rd Edition, Universities Press, Hyderabad.
4. Finite Element Analysis in Engineering Design By S.Rajasekharan, S.Chand Publications, New Delhi.
5. Finite Element Analysis By S.S. Bhavakatti-New Age International Publishers
6. Finite Element Analysis By P Seshu-PHI Learning Publications.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ARTIFICIAL NEURAL NETWORKS	L	T	P	C
21D35203a	(PE-III)	3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- Define what is Neural Network and model a Neuron and Express both Artificial Intelligence and Neural Network
- Analyze ANN learning, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning and Boltzmann learning
- Implement Simple perception, Perception learning algorithm, Modified Perception learning algorithm, and Adaptive linear combiner, Continuous perception, learning in continuous perception.
- Analyze the limitation of Single layer Perceptron and Develop MLP with 2 hidden layers, Develop Delta learning rule of the output layer and Multilayer feed forward neural network with continuous perceptions.

Course Outcomes (CO): Student will be able to

- Model Neuron and Neural Network, and to analyze ANN learning, and its applications
- Perform Pattern Recognition, Linear classification.
- Develop different single layer/multiple layer Perception learning algorithms
- Design of another class of layered networks using deep learning principles

UNIT - I	Lecture Hrs:10

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: Hibbing Learning, Competitive Learning, and Boltzmann Learning.

UNIT - II	Lecture Hrs:10

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	Lecture Hrs:10

UNSUPERVISED LEARNING-1: Kohenen 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	Lecture Hrs:9

ASSOCIATIVE MEMORY NETWORKS : Introduction, Auto Associative Memory ,Hetero Associative Memory, Bidirectional Associative Memory(BAM) -Theory and Architecture, BAM Training Algorithm-Storage.

UNIT - V	Lecture Hrs:9

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 .

Textbooks:

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COURSE STRUCTURE & SYLLABI

1. Introduction to Artificial Neural Systems- Jacek M. Zurada – Jaico Publishing, 2006.
2. Introduction to Neural Networks Using Matlab 6.0, S.N.Sivanandam , S.N.Deepa, Tata McGraw- Hill Publications, 2006.
3. Fuzzy Logic with Engineering applications-Timothy J Ross-Wiley Publishers.

Reference Books:

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

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	THEORY and ANALYSIS of PLATES and SHELLS	L	T	P	C
21D35203b	(PE-III)	3	0	0	3
	Semester	II			

Course Objectives: This course will enable students:

- Introduce with concept of plate theory,the behaviour and analysis
- Knowledge about classification of shell surfaces
- To analyse the plate with different boundary conditions
- To understand the classical theory oh shells based on the kirchoff-love assumptions.

Course Outcomes (CO): Student will be able to

- Assess the strength of plate panels under point,linearly varying and uniformly distributed loads
- Analyze plates under different boundary conditions by various classical methods and approximated methods
- Familiar with classification of shells and classical shell theories and apply them in engineering design
- Exposed to single curved shells, doubly curves shells and cylindrical shells

UNIT - I	Lecture Hrs:10

INTRODUCTION: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT - II	Lecture Hrs:10

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 solution – Application to different cases – Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT - III	Lecture Hrs:10

CIRCULAR PLATES: Differential Equation for symmetrical bending of Laterally loaded circular Plates – Uniformly loaded circular plates –circular plate concentrically loaded – circular plate loaded at center

UNIT - IV	Lecture Hrs:9

Shells – functional behaviour – examples – structural behaviour of shells classification of shells – Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation.

Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugges simulations equations.

UNIT - V	Lecture Hrs:9

Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.

Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

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COURSE STRUCTURE & SYLLABI

Textbooks:
1. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MC Graw Hill Edition 2. Analysis and design of concrete shell roofs By G.S.Ramaswami. CBS publications. 3. Design of concrete shell roofs By Billington – Tata MC Graw Hill, New York
Reference Books:
1. Shell Analysis By N.K.Bairagi. Khanna Publishers, New Delhi. 2. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd 3. Design of concrete shell roofs By Chaterjee. Oxford and IBH.**,**

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	RELIABILITY BASED ENGINEERING DESIGN (PE-III)	L	T	P	C
21D35203c		3	0	0	3
	Semester	I			

Course Objectives: This course will enable students:

- Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.
- Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring
- Illustrate the basic concepts and techniques of modern reliability engineering tools.

Course Outcomes (CO): Student will be able to

- Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability
- Use control charts to analyze for improving the process quality.
- Describe different sampling plans
- Acquire basic knowledge of total quality management
- Understand the concepts of reliability and maintainability

UNIT - I	Lecture Hrs:10

Basic Statistics and Probability – Concepts of Structural Safety – Resistance Parameters and Distributions. Probabilistic Analysis of Loads Live Load & Wind Load

UNIT - II	Lecture Hrs:10

Determination of Reliability, Monte Carlo Study of Structural Safety.

UNIT - III	Lecture Hrs:10

Levels of Reliability Methods and Their Suitable Adoption in Structural Engineering Elements.

UNIT - IV	Lecture Hrs:9

Levels of Reliability Methods and Their Suitable Adoption in Structural Engineering Elements.

UNIT - V	Lecture Hrs:9

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.

Textbooks:

1. Structural Reliability Theory and Its Application Springer – Palle Thoft Christensen and M.J.Baker – Verlag, Berlon Haiderberg, Newyork 1982.
2. Structural Reliability Analysis and Prediction, R.E. Melchers, Elles Harwood, Chisester, England, 1987
3. Reliability Analysis and Design of Structures, Ranganathan, R., McGraw-Hill, New Delhi, 1990.

Reference Books:

1. Probability Concepts in Engineering Planning and Design Volume II, A.H.S. Ang and W.H.Tang, Jhon Wiley, Newyork 1984.
2. Reliability Engineering, by E.Bala Guruswamy, Tata McGraw Hill, 1994
3. Reliability Engineering, (3rdEdition), by LS Srinath, Affiliated East West Pvt Ltd,

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED CONCRETE TECHNOLOGY	L	T	P	C
21D21103a	(PE-IV)	3	0	0	3
	Semester	II			

Course Objectives: This course will enable students:

- To study the properties of concrete making materials
- To do mix design
- Famiiar with the methods of concrete
- Knowledge about advance tests on concrete

Course Outcomes (CO): Student will be able to

- To be familiar with the properties of concrete making materials
- Identify the influence and compatibility of chemcial,mineral admixtures in concrete
- Update the knowledge on recent advances in special concretes.
- Know about various methods of concrete
- Analyse the performance of concrete structure through microstructure analysis

UNIT - I — Lecture Hrs:10

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.

UNIT - II — Lecture Hrs:10

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.

UNIT - III — Lecture Hrs:10

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.

UNIT - IV — Lecture Hrs:9

ELASTICITY, SHRINKAGE AND CREEP: Modulus of Elasticity – Dynamic Modulus of Elasticity – Poisson's Ratio – Early Volume Changes – Swelling – Draying 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.

UNIT - V — Lecture Hrs:9

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.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

SPECIAL CONCRETES: Light Weight Concretes –Light Weight Aggregate Concrete- Cellular Concrete - No Fines Concrete – High Density Concrete – Fiber Reinforced Concrete – Different Types of Fibers - Factories Affecting Properties of FRC – Applications Polymer Concrete – Types of Polymer Concrete Properties of Polymer Concrete and Applications
Textbooks:
1. Properties of Concrete By A.M.Neville – Pearson Publication – 4th Edition 2. Concrete Technology By M.S.Shetty. – S.Chand & Co. ; 2004 3. Concrete Technology By A.R. Santha Kumar, Oxford University Press, New Delhi
Reference Books:
1. Concrete: Micro Structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers 2. Design of Concrete Mix By Krishna Raju, CBS Pubilishers. 3. Concrete Technology By A.M.Neville – Pearson Publication 4. Concrete Technology By M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi 5. Non-Destructive Test and Evaluation of Materials By J.Prasad & C.G.K. Nair , Tata Mcgraw Hill Publishers, New Delhi

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	STABILITY of STRUCTURES	L	T	P	C
21D35204a	(PE-IV)	3	0	0	3
	Semester	II			

Course Objectives: This course will enable students:

- Determine stability of columns and frames
- Determine stability of beams and plates
- Use stability criteria and concepts for analyzing discrete and continuous systems,
- To form differential equations for plate buckling

Course Outcomes (CO): Student will be able to

- Apply the torisonal buckling and plates for buckling concept
- Apply the inelastic behaviour of materials and analyse the inelastic charecter of column
- Analyse the frame structures
- Analyse the plate structures

UNIT - I Lecture Hrs:10

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 Trignometric Series –Determination of Allowable Stresses.

UNIT - II Lecture Hrs:10

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

UNIT - III Lecture Hrs:10

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.

UNIT - IV Lecture Hrs:9

MATHEMATICAL TREATMENT OF STABILITY PROBLEMS: Buckling Problem Orthogonality Relation –Ritz Method-Timoshenko Method, Galerkin Method

UNIT - V Lecture Hrs:9

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.

Textbooks:

1. Stability of Metalic Structure By Bleich –Mc Graw Hill
2. Theory of Beam Columns Vol I By Chen & Atsuta Mc.Graw Hill
3. Timoshenko and Gere., Theory of Elastic Stability, Mc Graw Hill Book Company, 1973.

Reference Books:

1. Elastic Stability of Structures, Smitses, Prentice Hall,1973.
2. Buckling of Bars Plates and Shells, Brush and Almorth., Mc Graw Hill Book Company ,1975.
3. Principles of Structural Stability Theory, Chajes, A., Prentice Hall,1974
4. Stability Theory of Structures, Ashwini Kumar, TATA Mc Graw Hill Publishing Company Ltd, New Delhi,1985.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	FRACTURE MECHANICS	L	T	P	C
21D35204b	(PE-IV)	3	0	0	3
	Semester	II			

Course Objectives: This course will enable students:

- To design based on linear elastic fracture mechanics
- To findout the variation of plasticzone over thickness of various elements
- To know about the plane strain and plane stress in slip planes
- To understand the fracture process of concrete and different materials

Course Outcomes (CO): Student will be able to

- Acquire basic skills in fracture mechanism of brittle materials
- Apply fracture mechanics theory to calculate stress areas
- Calculate the "energy release rate" around crack tips
- Examine crack growth due to fatigue

UNIT - I		Lecture Hrs:10

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

UNIT - II		Lecture Hrs:10

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

UNIT - III		Lecture Hrs:10

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

UNIT - IV		Lecture Hrs:9

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

UNIT - V		Lecture Hrs:9

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)

Textbooks:

1. Elementary Engineering Fracture Mechanics - David Broek, Battelle, Columbus Laboratories, Columbus, Ohieo, USA
2. Fracture and Fatigue Control in Structures - John M.Barsom, Stanley T.Rolfe, Ross H.Forney
3. Rock and other Quasi-brittle materials - Surender P Shah , Stuart E Swartz,Wiley 1995.

Reference Books:

1. Analysis of Concrete Structures by fracture mechanics, Elfgren L, Routledge,1990
2. Fracture Mechanics- Applications to concrete, Victor C.Li and Z P Bazant , ACI SP118
3. Fracture Mechanics , CT Suri and Zh jin , Elsevier Academic Press,2012

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	CAD LABORATORY II	L	T	P	C
21D35205		0	0	4	2
	Semester	II			

Course Objectives:

- To develop MATLAB codes for solution of simultaneous linear equations.
- To construct codes for 1D Finite Element problems.
- To identify methods to code for numerical integration techniques & statistical methods.
- To model finite difference methods.

Course Outcomes (CO): At the end of the course, students will be able to:

- To build MATLAB codes for solution of simultaneous linear equations.
- To create 1D Finite Element problems in a computational scheme.
- To design codes for numerical integration techniques & statistical methods.
- To propose computational techniques for solving monte carlo and finite difference methods.

List of Experiments:

1. Reinforcement Detailing In Beam Using Graphics.
2. Reinforcement Detailing In Slabs Using Graphics.
3. Reinforcement Detailing In Foundation Using Graphics.
4. Formulate set of simultaneous equations and solutions for the analysis of continuous beam using MATLAB (Gauss elimination).
5. Developing a computer program for the analysis of continuous beam and solving the unknowns using Gauss-Seidal method (maximum 9 unknowns).
6. Solution of Plane Stress and Plane Strain problems in MATLAB.
7. Solving 1D Finite Element Problems and plotting shape functions.
8. Estimation of volume of earthwork using numerical integration techniques.
9. Forecasting of water requirement using MATLAB.
10. Determination of mean, standard deviation of a given sample of concrete strengths and developing correlation between cube strengths and cylinder strengths.
11. Forecasting global temperature and analyzing climate change.
12. Solution of beam problems using Finite Difference Techniques.

References:

1. Rudra Pratap,Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Oxford University Press (2010).
2. Amos Gilat, MATLAB: An Introduction with Applications, 4ed Paperback (2012).
3. MATLAB Documentation.
4. New Artificial Intelligence (Fundamental), Takashi Maeda and Fumio Aoki, Ohmsha, ISBN4-274-13179.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED CONCRETE LABORATORY	L	T	P	C
21D35206		0	0	4	2
	Semester	**II**			

Course Objectives: The students will acquire knowledge about

- To learn the principles of workability in cement concrete.
- To learn the preliminary tests on aggregates like flakiness test, elongation test, specific gravity, bulk density fineness modulus.
- To know the compression test, Young's modulus test procedures
- To learn the mix design procedure

Course Outcomes (CO): At the end of the course, students will be able to:

- Assess the workability of cement concrete and its suitability, quality of concrete
- Assess the quality of fine and coarse aggregates after testing the aggregates according to IS specifications.
- Test the quality of cement concrete by conducting compressive strength on concrete cubes.
- Design different grades of mix design and also asses the fineness of cement, flash, silica

List of Experiments

1. Mix Design of Concrete and Casting of Specimen
2. Mix Design of High Strength Concrete Including Casting and Testing of Specimens.
3. Fresh properties of self-compacting concrete
4. Permeability of Hardened concrete
5. Rapid chloride permeability of hardened concrete & Carbonations Studies.
6. Compressive strength split tensile strength & flexural strength of self compacting concrete.
7. Young's Modulus of Concrete
8. Accelerated Curing Test On Concrete Cubes.
9. Non Destructive Tests On Concrete.
10. Mix Design of Concrete using Mineral Admixtures.
11. Bending Test On A RCC Beam Under:
    i. Single Point Load
    ii. Two Point Load

References:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
3. Concrete Technology by A.R. Santha kumar, Oxford University Press.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	EARTHQUAKE RESISTANT DESIGN OF BUILDINGS (PE-V)	L	T	P	C
21D35301a		3	0	0	3
	Semester	III			

Course Objectives: This course will enable students:

- To understand effects of earthquakes on engineering structures and its measurement
- to apply dynamics loads on various structures
- to design buildings for earthquake loads as per IS Codes
- to understand and implement the concept of ductility in Earthquake Resistant Design

Course Outcomes (CO): Student will be able to

- Illustrate the measurement of earthquakes and their effect on engineering structures
- Analyse the free and forced vibration response of single degree and multi degree of freedom and continuous systems
- Apply the basic principles of conceptual design of Earthquake Resistant buildings
- Learn the various seismic control methods

UNIT - I		Lecture Hrs:10

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

UNIT - II		Lecture Hrs:10

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.

UNIT - III		Lecture Hrs:10

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- Δ 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.

UNIT - IV		Lecture Hrs:9

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.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

UNIT - V		Lecture Hrs:9
Fundamentals of Seismic Planning: Selection of Materials and Types of Construction Form of Superstructure – Framing Systems and Seismic Units – Devices for Reducing. Earthquake Loads,		
Textbooks:		
1. Design of Earthquake Resistant Structures By Minoru Wakabayashi. 2. Strucutural Dynamics for Earthquake Engineering", A.K.Chopra,Pearson Pubilications. 3. Dynamics of Structures. R.W.Clough, Mc Graw – Hill, 2nd Edition,		
Reference Books:		
1. Fundamentals of Earthquake Engineering,N.M Newmark and E.Rosenblueth, Prentice Hall,1971. 2. Earthquake Design Practice for Buildings. David Key," Thomas Telford,London,1988 3. Earthquake Engg; R.L. Wegel, Prentice Hall 12nd Edition 1989. 4. Design of Multi –Storied Buildings for Earthquake Ground Motions J.A. Blume, N.M. Newmark, L.H. Corning.,', Portland Cement Association, Chicago,1961 5. I.S.Codes No. 1893,4326,13920. 6. Earthquake Resistant Design By Pankaj Agarwal.		

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	CAD AND COMPUTER APPLICATIONS IN	L	T	P	C
21D35301b	STRUCTURAL ENGINEERING (PE-V)	3	0	0	3
	Semester	**III**			

Course Objectives: This course will enable students:

- Calculation of distribution of forces within the structure and the displaced state of the system forms the crux of design process.
- To learn computer aided methods of analysis adopted in industry for such purposes.

Course Outcomes (CO): Student will be able to

- Have an overall understanding of CAD concepts and CAD system developments
- Demonstrate the geometry transformation of 2D and 3 D models and its application in CAD systems
- Have an understanding of mathematical representation of computational geometry by planar and space curves and surfaces defined by different boundary curves
- Have knowledge of Engineering optimization using non-linear programming and to introduce stochastic search techniques
- To understand the importance of Data Base Systems in CAD systems

UNIT - I	Lecture Hrs:10

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.

UNIT - II	Lecture Hrs:10

TRANSFORMATION IN GRAPHICS – Coordinate System Used Lin Graphics & Windowing, View Port, 2 – D Transformations, Clipping, 3-D Transformation; C-Graphics.

UNIT - III	Lecture Hrs:10

STIFFNESS METHOD : Microsoft Excel Procedure for Stiffness Method of Analysis Step – By Step Procedure Using Excel, Examples Using Excel.

UNIT - IV	Lecture Hrs:9

ANALYSIS OF BEAMS USING STIFFNESS METHOD : Long Hand Solution of Single Span Beams, Continuous Beams Solution of Single Span Beams, Continuous Beams Using Excel.

UNIT - V	Lecture Hrs:9

DATABASE : Introduction, Concept of A Database, Objectives of Databases, Design of Data Base, Design Consideration of Data Base.

Textbooks:

1. Computer Aided Design, Software & Analytical Tools – C.S.Krishna Murthy & Rajiv S. – Narosa Publishing House India.
2. Computer Aided Design in Rainforced Concrete – Dr L.Shah-Structures Publishers Pune.
3. Matrix Computer Analysis of Structures, Moshi, F., Rubinstein Prentice Hall 1986.

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Reference Books:

1. IS – 456 -2000
2. Limit State Design – A.Jain.
3. Computer Application – Boyd C.Panbou Mc Graw Hill 1997.
4. Raker D., and Rice H. Inside Aut CAD, BPD Publication, Delhi, 1986.
5. Nancy Andrews – Windows The Official Guide to Microsoft Operation Environment, Micro Soft, 1986.

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	MANAGEMENT INFORMATION SYSTEMS	L	T	P	C
21D35301c	(PE-V)	4	0	0	4
	Semester	III			

Course Objectives:

- To provide the basic concepts of data and Management Information System and utility of the MIS for the managerial decisions.
- To Explain Management of Information system, MIS design and implementation process in an organisation.
- To discuss security, ethical and social issues in management of Information system.

Course Outcomes (CO): Student will be able to

- Know Management of Information system scope, application and challenges in managing MIS.
- Understand traditional and modern approaches for data resource management and models.
- Evaluate product based and process based cost and benefit to implement and maintain MIS in an organization.

UNIT - I	Lecture Hrs: 8

MIS An overview- Introduction, Need for MIS and IT nature and scope of MIS, MIS characteristics, Structure of MIS, role of MIS in global business. Challenges of Managing MIS.

UNIT - II	Lecture Hrs: 12

Data resource management- Data base concepts, The traditional approaches, the modern approaches (Data base management approaches) DBMS, Data models, Data ware housing and mining.

UNIT - III	Lecture Hrs:12

Business application of IS- Enterprise systems, ERP, CRM, SCM, DSS, Types of decisions, Decision support techniques, Decision making and Role of MIS, Business intelligence and Knowledge management systems.

UNIT - IV	Lecture Hrs:12

Management of IS- Project planning, SDLC, System development models, Project management, system analysis, system design, Implementation process, Product based MIS evaluation, Cost /Benefit based evaluation, Process based calculation, System maintenance

UNIT - V	Lecture Hrs:12

Security, Ethical &Social Issues : IS security threats, Protecting IS,IS Security Technologies, The disaster recovery plan, IS Ethical Issues, social issues.

Textbooks:

1. MIS –Managerial Perspective, D.P.Goyal,Vikas Publications.
2. Management Information Systems Text & Cases, W S Jawadekar, Tata McGraw-Hill.

Reference Books:

1. Management Information Systems, C Laudon and Jane P.Laudon, et al, Pearson Education.
2. MIS, Hossein Bidgoli, Nilanjan Chattopadhyay, Cengage Learning
3. Introduction to Information Systems, Rainer, Turban, Potter, WILEY-India.
4. Management Information Systems, James A. Obrein, Tata McGraw-Hill .
5. Cases in MIS, Mahapartra,PHI.
6. Management Information Systems, Gordon B. Davis & Margrethe H.Olson, Tata McGraw-Hill .

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc20_mg60/preview
https://nptel.ac.in/courses/110/105/110105148/
https://onlinecourses.swayam2.ac.in/cec21_ge05/preview

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AUDIT COURSE-I

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
21DAC101a		2	0	0	0
	Semester	I			

Course Objectives: This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO): Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

UNIT - I	Lecture Hrs:10

1Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

UNIT - II	Lecture Hrs:10

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

UNIT - III	Lecture Hrs:10

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

UNIT - IV	Lecture Hrs:9

Key skills needed for writing a Title, Abstract, and Introduction

UNIT - V	Lecture Hrs:9

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

Suggested Reading

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	DISASTER MANAGEMENT	L	T	P	C
21DAC101b		2	0	0	0
	Semester	I			

Course Objectives: This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

UNIT - I

Introduction:
Disaster:Definition,FactorsandSignificance;DifferenceBetweenHazardandDisaster;Naturaland Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

UNIT - II

Repercussions of Disasters and Hazards:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsandFamines,Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III

Disaster Preparedness and Management:
Preparedness: Monitoring of Phenomena Triggering ADisasteror Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV

Risk Assessment Disaster Risk:
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - V

Disaster Mitigation:
Meaning,ConceptandStrategiesofDisasterMitigation,EmergingTrendsInMitigation.Structural Mitigationand Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading

1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies
2. "'New Royal book Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi.

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ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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COURSE STRUCTURE & SYLLABI

Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
21DAC101c		2	0	0	0
	Semester	**I**			

Course Objectives: This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancientliterature

Course Outcomes (CO): Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

UNIT - I		
Alphabets in Sanskrit,		
UNIT - II		
Past/Present/Future Tense, Simple Sentences		
UNIT - III		
Order, Introduction of roots		
UNIT - IV		
Technical information about Sanskrit Literature		
UNIT - V		
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics		

Suggested Reading

1.“Abhyaspustakam” –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2.“Teach Yourself Sanskrit” Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3.“India’s Glorious ScientificTradition” Suresh Soni, Ocean books (P) Ltd.,New Delhi

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AUDIT COURSE-II

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Course Code	PEDAGOGY STUDIES	L	T	P	C
21DAC201a		2	0	0	0
	Semester	II			

Course Objectives: This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes (CO): Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials best support effective pedagogy?

UNIT - I

Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories oflearning,Curriculum,Teachereducation.Conceptualframework,Research questions**.** Overview of methodology and Searching.

UNIT - II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT - III

Evidence on theeffectivenessofpedagogicalpractices,Methodologyfortheindepthstage:quality assessmen t of included studies. How can teacher education (curriculumandpracticum) andthescho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of th body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacherandthecommunity.Curriculumandassessment,Barrierstolearning:limitedresourcesand large class sizes

UNIT - V

Researchgapsandfuturedirections: Researchdesign**,**Contexts**,**Pedagogy**,**Teachereducation**,** Curriculum and assessment**,** Dissemination and research impact.

Suggested Reading

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof
3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.

5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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Course Code	STRESSMANAGEMENT BY YOGA	L	T	P	C
21DAC201b		2	0	0	0
	Semester	II			

Course Objectives: This course will enable students:

- To achieve overall health of body and mind
- To overcome stres

Course Outcomes (CO): Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT - I

Definitions of Eight parts of yog.(Ashtanga)

UNIT - II

Yam and Niyam.

UNIT - III

Do`sand Don't'sin life.
i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii)
Shaucha,santosh,tapa,swadhyay,ishwarpranidhan

UNIT - IV

Asan and Pranayam

UNIT - V

i)Variousyogposesand theirbenefitsformind &body
ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam

Suggested Reading

1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur
2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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Course Code	PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENTSKILLS	L	T	P	C
21DAC201c		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes (CO): Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geetawilllead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT - I

Neetisatakam- Holistic development of personality
Verses-19,20,21,22(wisdom)
Verses-29,31,32(pride &heroism)
Verses-26,28,63,65(virtue)

UNIT - II

Neetisatakam- Holistic development of personality
Verses-52,53,59(dont's)
Verses-71,73,75,78(do's)

UNIT - III

Approach to day to day work and duties.
ShrimadBhagwadGeeta:Chapter2-Verses41,47,48,
Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

UNIT - IV

Statements of basic knowledge.
ShrimadBhagwadGeeta:Chapter2-Verses 56,62,68
Chapter12 -Verses13,14,15,16,17,18
Personality of Rolemodel. Shrimad Bhagwad Geeta:

UNIT - V

Chapter2-Verses 17,Chapter3-Verses36,37,42,
Chapter4-Verses18,38,39
Chapter18– Verses37,38,63

Suggested Reading

1."SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata
2.Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, RashtriyaSanskrit Sansthanam, New Delhi.

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OPEN ELECTIVE

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M.TECH. IN COMPUTER AIDED STRUCTURAL ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	COST MANAGEMENT OF ENGINEERING PROJECTS	L	T	P	C
21DOE301a		3	0	0	3
	Semester	I			

Course Objectives:

- To explain cost concepts and objectives of costing system and cost management process
- To provide knowledge and explain Cost behaviour in relation to Volume and Profit and pricing decisions.
- To know the concepts of target costing, life cycle costing and activity based cost management in a project or business.
- To discuss on budget and budgetary control , type of budgets in a business to control costs
- To provide knowledge on project, types of projects, stages of project execution, types of project contracts and project cost control.

Course Outcomes (CO): Student will be able to

- Know the cost management process and types of costs
- Learn and apply different costing methods under different project contracts
- To understand relationship of Cost-Volume and Profit and pricing decisions.
- Prepare budgets and measurement of divisional performance.
- Acquires knowledge on various types of project contracts, stages to execute projects and controlling project cost..

UNIT - I		Lecture Hrs:10

Introduction and Overview of the Strategic Cost Management Process - Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT - II		Lecture Hrs:12

Cost Behavior and Profit Planning: Marginal Costing- Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems; Pareto Analysis Just-in-time approach, Theory of constraints.; Divisional performance management: - Measurement of Divisional profitability - pricing decisions - transfer pricing.

UNIT - III		Lecture Hrs:10

Target costing- Life Cycle Costing - Activity-Based Cost management:- Activity based costing- Value-Chain Analysis- Bench Marking; Balanced Score Card.

UNIT - IV		Lecture Hrs:10

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT - V		Lecture Hrs:12

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

Textbooks:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
2. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler

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publisher
Reference Books:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi 2. Charles T. Horngren and George Foster, Advanced Management Accounting 3. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd
Online Learning Resources:
https://nptel.ac.in/courses/105/104/105104161/ https://nptel.ac.in/courses/112/102/112102106/

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COURSE STRUCTURE & SYLLABI

Course Code	INDUSTRIAL SAFETY	L	T	P	C
21DOE301b		3	0	0	3
	Semester	III			

Course Objectives:

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

Course Outcomes (CO): Student will be able to

- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

UNIT - I — Lecture Hrs:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT - II — Lecture Hrs:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT - III — Lecture Hrs:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT - IV — Lecture Hrs:

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT - V — Lecture Hrs:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Textbooks:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:

1.Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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Course Code	**BUSINESS ANALYTICS**	**L**	**T**	**P**	**C**
21DOE301c		**3**	**0**	**0**	**3**
	Semester	**III**			

Course Objectives:

- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

Course Outcomes (CO): Student will be able to

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT - I	Lecture Hrs:
Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.	
UNIT - II	Lecture Hrs:
Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.	
UNIT - III	Lecture Hrs:
Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling	
UNIT - IV	Lecture Hrs:
Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools	
UNIT - V	Lecture Hrs:
Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.	

Textbooks:

1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.