Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Curriculum for

S. Y. M. Tech.

STRUCTURES (Civil Engineering)

(Pattern 2018:R1)

Department of Civil Engineering

VISION:

Excellence in Civil Engineering Education

MISSION:

M1: Make competent Civil Engineers with high level of professional, moral and ethical values

M2: Impart highest standards in theoretical as well as practical knowledge and skill set

M3: Establish Center of Excellence in major areas of Civil Engineering to respond to the current and future needs of the industry, higher studies as well as research

Department of Civil Engineering

Second Year M. Tech. (SYMT) –Structures (Civil Engineering)
Semester III (Pattern 2018: R1)

Course Code	Course	Course Type	Teaching Scheme		Examination Scheme					Total	Credits
					Formative Assessment			Summative Assessment			
			L	P	ISE		CE	ESE	OR		
					T1	T2					
CVPB21183A	Industry Internship Project – I	CE-OR	-	20	-	-	200	-	100	300	10
	Total		-	20	-	-	200	-	100	300	10
OR											
CVPB21183B	Value added course	CE-OR	2/0	8/12	-	-	100	-	50	150	6
CVPB21183C	Dissertation Phase – I	CE-OR	-	8	-	-	100	-	50	150	4
	Total		2/0	16/20	-	-	200	-	100	300	10

Value added course

1. CSPA21183B: Python Programming
2. MEPA21183B: CAE using ANSYS
3. CVPB21183B: Systems Approach in Engineering

Second Year M. Tech. (SYMT) –Structures (Civil Engineering)
Semester IV (Pattern 2018: R1)

Course Code	Course	Course Type	Teaching Scheme		Examination Scheme					Total	Credits
					Formative Assessment			Summative Assessment			
			L	P	ISE		CE	ESE	OR		
					T1	T2					
CVPB22183A	Industry Internship Project - II/ Dissertation Phase – II	CE-OR	-	32	-	-	100	-	100	200	16
	Total		-	32	-	-	100	-	100	200	16

BoS Chairman **Dean Academics** **Director**

SEMESTER - I

Department of Civil Engineering

Python Programming (CSPA21183B)

Teaching Scheme

Credits: 6
Lectures: 2 Hrs./week
Practical: 8 Hrs./week

Examination Scheme

Formative Assessment: 100 Marks
Summative Assessment (Oral): 50 Marks

Course objectives:

1. Study of new technology in the field of course
2. Understand importance of life learning processes through internship experiences.

Course Outcomes: Upon completion of this course, the student will be able to:

1. Exposure to state of art technology in the respective field of course
2. Have an in-depth knowledge about the subject chosen as value added course.

Unit 1 – Python Fundamentals

Introduction to Python Language: History, Features Installing python on Linux, Setting up path, Working with Python. Basic Syntax, Variable and Data Types , Operator, Conditional, Loop, Control statements, String manipulations, Lists, Tuple, Dictionaries, Sets Functions, Modules, Input-Ouput, Exception Handling.

Unit 2 – Object Oriented Programming using Python

OOP basics, class, objects, constructor, class diagram, encapsulation, reference variables, pass by reference, self, collection objects, static attribute, static method, relationships, inheritance, abstract class, abstract method.

Unit 3 – Data Structures & Algorithms using Python

Introduction to data structures, Linked List, Stack, Queue, Trees, Graphs, Hashing & Hash Tables, Linear & binary search algorithm, Sorting Algorithms, Selection Sort, Bubble Sort, Merge Sort, Quick Sort, Greedy Approach, Dynamic Programming

Unit 4 – Python Libraries for Data Cleaning, Preparation, and Wrangling

Understanding the N-dimensional data structure, Creating arrays, Indexing arrays by slicing or more generally with indices or masks, Basic operations and manipulations on N-dimensional arrays, **NumPy and 2D Plotting,** Plotting with matplotlib

Pandas: Working with Pandas data structures: Series and Data Frames, Accessing your data: indexing, slicing, fancy indexing, boolean indexing, Data wrangling, including dealing with dates and times and missing datas, Adding, dropping, selecting, creating, and combining rows and columns.

Unit 5 – Database access

Python Database Integration – Pre-requisites and Installation, SELECT Operation, CREATE and INSERT Operation, UPDATE Operation, DELETE Operation
Executing SQL commands from Pandas, Loading database data into a Data Frame, Combining and manipulating Data Frames: merge, join, concatenate.

Unit-6: Data Analysis using Python

Split-apply-combine with Data Frames, Data summarization and aggregation methods Pandas powerful group by method , Reshaping, pivoting, and transforming your data, Simple and rolling statistics
Data visualization: scatter plots, line plots, box plots, bar charts, and histograms with matplotlib, Customizing plots: important attributes and arguments, Scikit library for ML: Regression, Classification and Clustering, Text processing using nltk library.

Text Books:

1. Learning Python: Powerful Object-Oriented Programming
2. Kenneth A Lambert and B L Juneja, "Fundamentals of PYTHON", CENGAGE Learning, ISBN:978-81-315-2903-4
3. Zed A. Shaw, "Learn PYTHON The Hard Way", Pearson, ISBN: 978-93-325-8210-1

Reference Books :

1. Allen B Downey, "Think PYTHON", O'Rielly, ISBN: 13:978-93-5023-863-9, 4th Indian Reprint 2015

Department of Civil Engineering

CAE using ANSYS (MEPA21183B)

Teaching Scheme

Credits: 6
Lectures: NIL
Practical: 12 Hrs./week

Examination Scheme

Formative Assessment: 100 Marks
Summative Assessment (Oral): 50 Marks

Course objectives:

1. To understand basic techniques of CAE and ANSYS
2. Model and analyze the Mechanical Elements using ANSYS

Course Outcomes: Upon completion of this course, the student will be able to:

1. Describe a basics of FEA process
2. Employ engineering, scientific, and mathematical principles to execute Pre-Processing
3. Create 3D solid models of mechanical components and applying effective meshing.
4. Model and analyze the mechanical elements
5. Understand the post processing in ANSYS.
6. Investigate different case studies on linear and non linear analysis.

Unit 1 – Basics of Finite Element Analysis (FEA)

Theory of Finite Element Analysis, Nodes, Elements, Shape Function, Selection of Material Model, Element Type, Stiffness Matrix Formulation & Solving Methods, Extracting Deformation, Strain & Stress

Unit 2 – Pre-Processing

CAD Modeling In design Modeler, Sketching, Dimensioning, Constraints, 2D & 3D CAD Modeling, Importing CAD Geometry, Advanced CAD Cleanup, CAD Preparation for Contacts, Meshing & Analysis, CAD Parameterization, Body Selection Logic & Named Selection

Unit 3 –Meshing

Meshing Pre-Perquisite's, Selecting Mesh Methods, Meshing Settings, Mesh Overrides, Meshing Errors & Its Resolutions

Unit 4 – Analysis

Selecting Type of Analysis, Boundary Conditions, Types & Assignment, Type of Loads, Selecting Solver, Solver Settings, Non Convergence Issues & Its Resolution.

Unit 5 – Post-Processing

FEA Error Estimation, Checking Accuracy of Solution, Sections & Animation, Plots & Charts, Detailed Report Preparation

Unit-6:FEA in Practice

Material Models (Nonlinear Materials) & There Selection, Types of Analysis (Modal, Thermal, Thermo-Structural, Pre-Stress Modal)

Text Books:

1. Finite Element simulations using ANSYS, Esam M. Alawadhi CRC Press , ISBN 9781482261974 - CAT# K24312,
2. Karl ANSYS Mechanical APDL for Finite Element Analysis by John Martin Thompson and Mary Kathryn Thompson, B&H Publisher, 2015

Systems Approach in Engineering (CVPB21183B)

Teaching Scheme

Credits: 6
Lectures: 4 Hrs./week
Practical: NIL

Examination Scheme

Formative Assessment:100 Marks
Summative Assessment.:50 Marks

Course Objectives:

1. To introduce the students of Civil Engineering the concept of system approach and optimization Techniques.
2. To make students familiar with linear and nonlinear optimization Problems
3. To introduce students to stochastic as well as dynamic programming

Course Outcomes: Upon completion of this course, the student will be able to:

1. Understand basics of SACE and perform sequencing of n jobs over 2,3 m machine
2. Implement Dichotomous, Fibonacci, Golden section methods to solve unconstrained nonlinear univariate problems, gradient techniques for Multivariate problems and Lagrange Multiplier Techniques for constrained optimization problems
3. Solve queuing problems using (M/M/1): (FCFS//) model and perform Monte Carlo simulation
4. Use dynamic programming to solve multistage decision processes of multi-project investment and pipeline laying
5. Formulate and solve linear programming problems using simplex, Big M, Two phase and duality methods
6. Solve transportation and assignments problems using linear programming techniques

Unit I – Introduction to systems approach

Introduction to System approach, Operations Research and Optimization Techniques, Use of systems approach in Civil Engineering, Methods, Introduction to Linear and Nonlinear programming methods (with reference to objective function, constraints), Local & Global optima, unimodal function, convex and concave function , Sequencing– n jobs through 2, 3 and M machines.

Unit II: Non-Linear programming

Single variable unconstrained optimization: Sequential Search Techniques-Dichotomous, Fibonacci, Golden section, Multivariable optimization without constraints-The gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton's Method. Multivariable optimization with equality constraints - Lagrange Multiplier Technique

Unit III: Stochastic Programming

Queuing Theory : elements of Queuing system and its operating characteristics, waiting time and ideal time costs, Kendall's notation, classification of Queuing models, single channel Queuing theory : Model I (Single channel Poisson Arrival with exponential services times, Infinite population (M/M/1): (FCFS//), Simulation: Monte Carlo Simulation.

Unit IV: Dynamic Programming

Multistage decision processes, Principle of optimality, recursive equation, Applications of D.P.

Unit V: Linear Programming (A)

Formulation of Linear optimization models for Civil engineering applications. The simplex method, Method of Big M, Two phase method, duality

Unit VI: Linear Programming (B)

The Transportation Model and its variants, Assignment Model, and its variants.

Text books:

1. Engineering Optimization by S. S. Rao
2. Operations Research by Hamdy A. TaHA
3. Quantitative Techniques in Management by N.D. Vohra (McGraw Hill)
4. Operations Research by Premkumar Gupta and D. S. Hira, S. Chand Publications (2014).

Reference Books:

1. Topics in Management Science by Robert E. Markland (Wiley Publication)
2. An Approach to Teaching Civil Engineering System by Paul J. Ossenbruggen
3. A System Approach to Civil Engineering Planning & Design by Thomas K. Jewell (Harper Row Publishers)