

According to New Revised Credit System Syllabus

SPPU

Third Year (T.E.) Degree Course In
MECHANICAL ENGINEERING (Semester - VI)

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING



Includes

- Model Question Papers For Practice
(In Sem-30 Marks & End Sem- 70 Marks)
- MCQ's with Answers

Dr. GANESH V. KARBHARI
Dr. KASHINATH H. MUNDE
PROF. GANESH E. KONDHALKAR

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 **NIRALI**
PRAKASHAN
ADVANCEMENT OF KNOWLEDGE

A TEXT BOOK OF

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

FOR
SEMESTER – VI

THIRD YEAR DEGREE COURSE IN
MECHANICAL ENGINEERING

Strictly According to New Revised Credit System Syllabus
of Savitribai Phule Pune University
(w.e.f. June 2021)

Dr. GANESH V. KARBHARI

Ph.D., M.E. (Signal Processing)
Data Scientist, Associate Professor,
E&TC Engineering Dept.,
Anantrao Pawar College of Engg. and Research,
PUNE.

Dr. KASHINATH H. MUNDE

Ph.D., M.E. (Design Engg.)
Professor,
Mechanical Engineering Dept.,
Anantrao Pawar College of Engg. and Research,
PUNE.

Prof. GANESH E. KONDHALKAR

M.E. (Heat Power)
Head, Mechanical Engineering Dept.,
Anantrao Pawar College of Engg. and Research,
PUNE.

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DISTRIBUTION CENTRES**PUNE**

Nirali Prakashan
(For orders outside Pune)
 S. No. 28/27, Dhayari Narhe Road, Near Asian College
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Rasdharma Co-op. Hsg. Society Ltd., 'D' Wing Ground Floor, 385 S.V.P. Road
 Girgaum, Mumbai 400004, Maharashtra
 Mobile : 7045821020, Tel : (022) 2385 6339 / 2386 9976
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SOLAPUR**Nirali Prakashan**

R-158/2, Avanti Nagar, Near Golden
 Gate, Pune Naka Chowk
 Solapur 413001, Maharashtra
 Mobile 9890918687
 Email : solapur@niralibooks.com

marketing@pragationonline.com | www.pragationonline.com

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PREFACE

It gives us great pleasure to present the book '**Artificial Intelligence and Machine Learning**' for the students of **Third Year (TE) Degree Course in Mechanical Engineering** of Savitribai Phule Pune University. This book is strictly as per the **New Revised Credit System Syllabus 2019 Pattern** with effect from the Academic Year June 2021.

As per New Revised Examination Scheme which has been implemented from this academic year, In-Semester assessment carries 30 marks over first two units and End-Semester Examination carries 70 marks on the remaining units 3, 4, 5 and 6.

The Theory Course will have 3 Credits.

In this book, all the basic concepts are explained in simplified manner. Subject matter is presented more in a conceptual manner than mathematical, as required by the new examination system. It is our objective to keep the presentation systematic and clear through explanatory notes and figures.

Main feature of this book is, **Complete Coverage of the New Credit System Syllabus with solved Examples, Exercises and Model Question Papers of In Sem. and End Sem. Exams.**

Also we have given **Multiple Choice Questions** at the end of book.

We are sure that this book will cater to all needs of the students for this subject.

We take this opportunity to express our sincere thanks to Shri. Dineshbhai Furia, Shri. Jignesh Furia, Mrs. Nirali Verma, Mrs. Deepali Lachake (Co-ordinator), and entire team of Nirali Prakashan who really have taken keen interest and untiring efforts in publishing this volume.

We wish to make a special mention of the valuable contribution made by Late Shri M.P. Munde during the last two decades in reaching out to students, parents and teachers which eventually made **Nirali Prakashan, a brand of trust and quality in technical books**. Without his perseverance and zeal, successive editions would not have been possible.

The advice and suggestions of our esteemed readers, to improve the text, are most welcome and will be highly appreciated.

CONTENTS

Unit I: Introduction to AI & ML

1.1-1.48

1.1	History of Artificial Intelligence (AI)	1.1
1.2	Maturation of Artificial Intelligence	1.2
1.3	Comparison of AI With Data Science	1.2
1.4	Need of AI in Mechanical Engineering	1.3
1.4.1	Mechanical Design	1.3
1.4.2	Big Data Storage and Usage through IT	1.4
1.4.3	Manufacturing	1.4
1.5	Introduction to Machine Learning	1.4
1.5.1	Types of AI Agents	1.5
1.6	Basics: Reasoning, Problem Solving	1.8
1.6.1	Problem-Solving Agents	1.8
1.6.2	Search Algorithm Terminologies	1.8
1.6.3	Properties of Search Algorithms	1.8
1.7	Knowledge Representation	1.29
1.7.1	Techniques of Knowledge Representation	1.30
1.7.2	Propositional Logic in Artificial Intelligence	1.31
1.8	Planning	1.37
1.9	Learning	1.38
1.10	Perception	1.38
1.11	Motion and Manipulation	1.38
1.12	Approaches to AI: Cybernetics and Brain Simulation, Symbolic, Sub-Symbolic, Statistical	1.38
1.13	Approaches to ML	1.39
1.13.1	Supervised Learning	1.39
1.13.2	Unsupervised Learning Method	1.41
1.14	Reinforcement Learning	1.43
1.14.1	What is Reinforcement Learning?	1.43
1.14.2	Terms Used in Reinforcement Learning	1.44
1.14.3	Key Features of Reinforcement Learning	1.44
1.14.4	Approaches to Implement Reinforcement Learning	1.44
1.14.5	Types of Reinforcement Learning	1.45
1.14.6	Markov Decision Process	1.45
1.14.7	Markov Property	1.46
1.14.8	Reinforcement Learning Algorithms	1.46
•	Exercise	1.48

Unit II: Feature Extraction and Selection

2.1-2.8

2.1	Feature Extraction: Statistical Features	2.1
2.1.1	Methods of Dimensionality Reduction	2.1
2.2	Principal Component Analysis	2.1
2.3	Feature Selection	2.1
2.4	Ranking	2.4
2.5	Decision Trees	2.4
2.6	Entropy Reduction and Information Gain, Exhaustive, Best First, Greedy Forward and Backward	2.7
2.7	Applications of Feature Extraction and Selection Algorithms in Mechanical Engineering	2.7
•	Exercise	2.8

Unit III: Classification and Regression	3.1-3.42
3.1 Classification	3.1
3.1.1 Random Forest	3.1
3.1.2 Naïve Bayes	3.1
3.1.3 Support Vector Machine	3.2
3.2 Regression	3.9
3.2.1 Linear Regression	3.9
3.2.2 Nonlinear Regression	3.10
3.2.3 Logistic Regression	3.11
3.2.4 Support Vector Regression	3.11
3.3 Regression Trees	3.12
3.3.1 Decision tree	3.12
3.3.2 Types of Decision Trees	3.13
3.4 Random Forest	3.15
3.5 K-Nearest Neighbor (KNN)	3.16
3.6 Linear Models for Regression	3.17
3.7 Least Squares and Nearest Neighbors	3.18
3.8 Linear Basic Function Models	3.19
3.9 The Bias-Variance Decomposition	3.21
3.10 Bayesian Linear Regression	3.24
3.11 Bayesian Model	3.24
3.12 Linear Models for Classification	3.26
3.12.1 Discriminant Functions	3.26
3.13 Probabilistic Discriminative Models	3.30
3.13.1 Multivariate Data	3.31
3.13.2 Parameter Estimation	3.31
3.13.3 Maximum Likelihood Estimation	3.31
3.13.4 Bayesian Estimation Methods	3.32
3.14 Multivariate Classification	3.33
3.15 Multivariate Regression Kernel Methods: Support Vector machines	3.33
3.15.1 Relevance Vector Machines	3.41
3.16 Application of Classification and Regression	3.41
• Exercise	3.41
Unit IV: Development of ML Model	4.1-4.6
4.1 Problem Identification: Classification, Clustering, Regression and Ranking	4.1
4.2 Steps for Machine Learning Modeling	4.1
4.3 Hyper Parameter Tuning and Predictions	4.5
• Exercise	4.6

Unit V: Reinforced and Deep Learning

5.1-5.24

- 5.1 What is Reinforcement Learning?
- 5.2 Characteristics of Reinforced Learning: Algorithms: Value Based, Policy Based and Model Based
- 5.3 Positive Vs Negative Reinforced Learning
- 5.4 Models: Markov Decision Process
- 5.5 Q-Learning
 - 5.5.1 Characteristics of Deep Learning
- 5.6 Artificial Neural Network
- 5.7 Biological Neuron
- 5.8 Artificial Neuron Model
- 5.9 Concept of Bias and Threshold
 - 5.9.1 Bias
 - 5.9.2 Threshold
- 5.10 Activation Functions
- 5.11 McCulloch-Pitts Neuron Model
- 5.12 Learning Paradigms
- 5.13 Convolution Neural Network
 - 5.13.1 Convolution Layer
 - 5.13.2 The Pooling Layer
 - 5.13.3 The Output Layer
 - 5.13.4 Applications of CNN
- 5.14 Application of Reinforced and Deep Learning in Mechanical Engineering

- **Exercise**

Unit VI: Applications

6.1-6.38

- 6.1 Human and Machine Interaction: The Five Ways an ML Algorithm /AI can Interact with People
- 6.2 Predictive Maintenance and Health Management
- 6.3 Fault Detection
- 6.4 Image Based Part Classification
 - 6.4.1 Image Classification
- 6.5 Process Optimization
- 6.6 Material Inspection
- 6.7 Tuning of Control Algorithms

- **Exercise**

- **Model Question Papers**

- In-Sem Exam. (30 Marks)
- End-Sem Exam. (70 Marks)


- **Multiple Choice Questions**



P.1-P.2

P.2-P.3

P.1-P.2



Sub. Code : 302050

Computer Aided Engineering

SPPU CBCS Scheme - Course 2019 - T.E. (MECH) - SEM - VI

- Simplified & Conceptual Approach
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- Solved SPPU Question Paper June 2022

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Anup Goel
Siddu S.
Shaikh Ubaid
Ashish R. Pawar
Jayashri V. Chopade

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As per Revised Syllabus of
SAVITRIBAI PHULE PUNE UNIVERSITY

Choice Based Credit System (CBCS)
T.E. (Mechanical) Semester - VI

COMPUTER AIDED ENGINEERING

Anup Goel

B.E. Mechanical
Post Graduation in Tool Design with CAD/CAM
Managing Director of AG Engineering Study Centre,
Akurdi, Pune
More than 13 Years Teaching Experience

Siddu S.

M.Tech. (PPE), B.E.(Mech.)
B.M.S.C.E Bangalore

Shaikh Ubaid

M.Tech. (Mechanical - PLM),
PLM Consultant,
Infinite Analytics,
Pune

Ashish R. Pawar

Ph.D. (Pursuing) (CoEP), M.E. (Design),
B.E. (Mechanical)
Assistant Professor,
ABMSP's Anantrao Pawar College of Engg. & Research,
Parvati, Pune

Jayashri V. Chopade

Ph.D. (Pursuing), M.Tech. (CAD/CAM)
Assistant Professor,
Pimpri Chinchwad College of Engg. & Research,
Ravet, Pune



FRIENDS BOOK CENTER
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PREFACE

The importance of **Computer Aided Engineering** is well known in various engineering fields. Overwhelming response to our books on various subjects inspired us to write this book. The book is structured to cover the key aspects of the subject **Computer Aided Engineering**.

The book uses plain, lucid language to explain fundamentals of this subject. The book provides logical method of explaining various complicated concepts and stepwise methods to explain the important topics. Each chapter is well supported with necessary illustrations, practical examples and solved problems. All the chapters in the book are arranged in a proper sequence that permits each topic to build upon earlier studies. All care has been taken to make students comfortable in understanding the basic concepts of the subject.

Representative questions have been added at the end of each Chapter to help the students in picking important points from that Chapter.

The book not only covers the entire scope of the subject but explains the philosophy of the subject. This makes the understanding of this subject more clear and makes it more interesting. The book will be very useful not only to the students but also to the subject teachers. The students have to omit nothing and possibly have to cover nothing more.

We wish to express our profound thanks to all those who helped in making this book a reality. Much needed moral support and encouragement is provided on numerous occasions by our whole family. We wish to thank the **Publisher** and the entire team of **Technical Publications** who have taken immense pain to get this book in time with quality printing.

Any suggestion for the improvement of the book will be acknowledged and well appreciated.

Authors
Anup Goel
Siddh S.
Shaikh Ubaid
Ashish R. Pawar
Dayashri V. Chopade

Dedicated to God and Family Members

SYLLABUS

Computer Aided Engineering - (302050)

Credits		Examination Scheme	
Theory	3	In-Semester	30 Marks
Practical	1	End-Semester	70 Marks
		Practical	50 Marks

Unit 1 Elemental Properties

Introduction to Computer Aided Engineering (CAE), Use of CAE in Product development, Discretization methods - Finite Element Method (FEM), Finite Difference Method (FDM) and Finite Volume Method (FVM), CAE Tools - Pre-processor, Solver and Post-Processor.

Element Shapes - 1D, 2D and 3D elements, Nodal Unknowns and field variables, Coordinate Systems, Shape Functions- linear, quadratic and cubic, Convergence Requirements of Shape Functions, Derivation of Polynomial Shape Functions using coordinate systems for Bar, Beam, Triangular, and rectangular elements. (Chapter - 1)

Unit 2 Meshing Techniques

Discretization of a Structure, 1D, 2D and 3D element Meshing, Element selection criteria, Refining Mesh, Effect of mesh density in critical region, Use of Symmetry.

Element Quality Criterion : Jacobian, Aspect ratio, Warpage, Minimum and Maximum angles, Average element size, Minimum Length, skewness, Tetra Collapse etc., Higher Order Element vs Mesh Refinement, Geometry Associate Mesh, Mesh quality, Bolted and welded joints representation, Mesh independent test. (Chapter - 2)

Unit 3 1D Finite Element Analysis

Consistent Unit System, Introduction to approaches used in Finite Element Analysis (FEA) such as direct approach and energy approach.

Bar and Truss Element - Element stiffness matrix, Assembling stiffness Equation, Load vector, stress and reaction forces calculations.

Temperature effect on Bar Element - Calculation due to uniform temperature change, Stress and reaction forces calculations. (Chapter - 3)

Unit 4 2D Finite Element Analysis

Plane Stress-Strain, axi-symmetric problems in 2D elasticity.

Constant Strain Triangle (CST) - Element Stiffness matrix, Assembling stiffness equation, Load vector, Stress and reaction forces calculations.

Post Processing Techniques - Check and validate accuracy of results, Average and Un-average stresses, and special tricks for Post Processing. Interpretation of results and design modifications, CAE reports. (Chapter - 4)

Unit 5 Non-Linear and Dynamic Analysis

Non-Linear Analysis : Introduction to Nonlinear Problems, Comparison of Linear and Nonlinear analysis, Types of Nonlinearities, Stress-strain measures for Nonlinear analysis, Analysis of Geometric, Material Nonlinearity, Solution Techniques for Nonlinear analysis, Newton Raphson Method, Essential steps in Nonlinear analysis.

Dynamic Analysis : Introduction to Dynamic Analysis, Comparison of Static and Dynamic analysis, Time domain and frequency domain, Types of loading, Simple Harmonic motion, Free vibration, Boundary conditions of free vibration, Solution. (Chapter - 5)

Unit 6 Applications of Computer Aided Engineering

Computational Fluid Dynamics (CFD) : Introduction, Three dimensions of Fluid Dynamics, Equilibrium Equation for a fluid, Conservation form of Fluid flow equation, Integral form of the Conservation Laws.

Injection moulding of Plastics : Simplification of Mould Geometry for FEA, Material Model for Mould FEA, Boundary Conditions for Mould FEA, Loading of Mould in FEA, Results Analysis.

Simulation for Manufacturing Processes like Casting and Sheet Metal Applications : Introduction and workflow of Casting Simulation Software and Sheet Metal Applications.

Durability Analysis : Durability, Reliability and Fatigue, FEA bases fatigue analysis viz : Stress-Life approach (S-N method) and Strain-Life approach (E-N method).

Crash Analysis : Introduction, Explicit time integration schemes, implicit integration schemes.

Noise Vibration and Harshness (NVH) Analysis : NVH Concepts, Terminology, FEA for structural Dynamics, FEA for Acoustics. (Chapter - 6)

TABLE OF CONTENTS

Unit 1

Chapter - 1	Elemental Properties	(1 - 1) to (1 - 82)
✓ 1.1	Introduction to Computer Aided Engineering	1 - 3
1.1.1	Applications of CAE.....	1 - 3
1.1.2	Benefits of CAE.....	1 - 3
✓ 1.2	Use of CAE in Product Development	1 - 4
✓ 1.3	Discretization Methods.....	1 - 5
1.3.1	Point Collocation Method.....	1 - 6
1.3.2	Sub Domain Method.....	1 - 10
1.3.3	Least Squares Method	1 - 11
1.3.4	Galerkin's Method	1 - 11
1.4	Non-Discretization Method / Variational Approach.....	1 - 17
1.4.1	Rayleigh Ritz Method.....	1 - 17
✓ 1.5	Finite Element Method (FEM)	1 - 23
1.5.1	Difference between Classical Method and FEM	1 - 24
1.5.2	Difference between Continuum Method and FEM	1 - 24
1.5.3	Difference between FDM and FEM	1 - 25
1.5.4	Difference between FEM and FVM	1 - 25
1.5.5	Comparisons between BEM, FEM and FDM.....	1 - 26
1.6	Brief History of FEM	1 - 26
✓ 1.7	Finite Element Terminology	1 - 27
1.7.1	Continuum or Domain	1 - 27
1.7.2	Node	1 - 27
1.7.3	Element.....	1 - 27
1.7.4	Degrees of Freedom	1 - 27
1.7.5	Loads or Forces	1 - 27

1.7.6	Constraints	1 - 28
1.7.7	Boundary Conditions	1 - 28
1.8	General FEM Procedure	1 - 29
1.8.1	Preprocessor, Processor and Post Processor.....	1 - 32
✓ 1.9	Element Shapes.....	1 - 32
1.9.1	Types of 1D Elements	1 - 33
1.10	Order of Elements	1 - 33
1.10.1	Element Library / Type of Elements	1 - 33
1.10.2	Higher Order Elements	1 - 37
1.10.3	Simplex, Complex and Multiplex Elements	1 - 37
1.10.4	Primary and Secondary Variables	1 - 37
1.11	Coordinates	1 - 38
1.12	Natural Coordinates	1 - 38
✓ 1.13	Natural Coordinates in Two Dimensional	1 - 42
1.14	Shape Function and its Properties	1 - 47
1.14.1	Derivation of Shape Function for Linear Bar Element in Global Co-ordinate System.....	1 - 47
1.14.2	Derivation of Shape Function for Linear Bar in Natural Co-ordinate System.....	1 - 49
1.14.2.1	Relation between Global and Natural Co-ordinate System	1 - 50
1.14.3	Derivation of Shape Function for 3 Node Bar (Quadratic Bar) in Natural Co-ordinate System.....	1 - 51
1.15	Isoparametric Elements	1 - 53
1.15.1	Terms : Isoparametric / Subparametric / Super Parametric	1 - 55
1.15.2	Uniqueness of Mapping	1 - 56
1.15.3	Rigid Body and Constant Strain Rate.....	1 - 57
1.15.4	Rules of Basic Law / Isoparametric Formulations	1 - 58
1.16	Lagrangean Interpolation Functions	1 - 59
1.16.1	Isoparametric Formulation of Bar Element using Lagrange's Polynomial.....	1 - 59
1.16.1.1	Two Noded Bar in Local Co-ordinates.....	1 - 59

1.16.1.2 Three Noded Bar in Local Co-ordinates	1 - 60
1.16.1.3 Cubic Bar (4 Noded Bar) in Local Co-ordinates	1 - 61
1.17 Shape Function for Linear Quadratic Element	1 - 62
1.18 Elemental Stiffness Matrix for Four Noded Quadrilateral Element	1 - 63
1.19 Serendipity Elements	1 - 75
1.20 Shape Function for Six Noded Triangular Elements	1 - 76
1.21 Shape Function for Eight Noded Triangular Elements	1 - 79
Review Questions	1 - 80
Multiple Choice Questions with Answers	1 - 81

Unit 2

Chapter - 2	Meshing Techniques	(2 - 1) to (2 - 36)
2.1	Introduction	2 - 2
2.1.1	Importance of Meshing	2 - 2
2.2	Types of Elements	2 - 2
2.3	Types of Meshing	2 - 4
2.4	Criteria for Good Meshing	2 - 5
2.5	Mesh Generation Methods	2 - 5
2.6	Mesh Refinement Methods	2 - 6
2.6.1	h - Refinement	2 - 6
2.6.2	P - Refinement	2 - 6
2.6.3	hP - Refinement	2 - 6
2.6.4	r - Refinement	2 - 7
2.6.5	Reducing the Element Size	2 - 7
2.6.6	Increasing the Element Order	2 - 7
2.6.7	Global Adaptive Mesh Refinement	2 - 8
2.6.8	Local Adaptive Mesh Refinement	2 - 9
2.6.9	Manually Adjusting the Mesh	2 - 9
2.6.10	Time - Domain and Frequency - Domain Meshing	2 - 10

2.6.11	Time - Adaptive Mesh Refinement	2 - 10
2.6.12	Wavelength - Adaptive Mesh Refinement	2 - 11
2.7	Use of Symmetry	2 - 12
2.8	Element Quality.....	2 - 14
2.9	Element Quality Criterion	2 - 16
2.9.1	Aspect Ratio	2 - 16
2.9.2	Skewness	2 - 22
2.9.3	Warpage.....	2 - 24
2.9.4	Minimum and Maximum Angles.....	2 - 28
2.9.5	Average Element Size	2 - 29
2.9.6	Minimum Refinement Length	2 - 29
2.9.7	Jacobian Ratio	2 - 30
2.9.8	Tetra Collapse	2 - 30
2.9.9	Twist.....	2 - 31
2.9.10	Taper	2 - 31
2.10	Higher Order Element Vs Mesh Refinement	2 - 32
2.11	Geometry Associate Mesh	2 - 32
2.12	Bolted and Welded Joints Representation	2 - 33
2.13	Mesh Independent Test.....	2 - 35
	Review Questions.....	2 - 35
	Multiple Choice Questions with Answers	2 - 36

Unit 3

Chapter - 3	1D Finite Element Analysis	(3 - 1) to (3 - 102)
3.1	Consistent Unit System	3 - 3
3.2	Approaches used in Finite Element Analysis (FEA)	3 - 4
3.2.1	Direct Approach.....	3 - 4
3.2.2	Variational Approach	3 - 5
3.2.3	Energy Approach.....	3 - 6
3.2.4	Weighted Residual Approach	3 - 6

3.3	Types of 1D Elements.....	3 - 7
3.4	Derivation of Stiffness Matrix of Bar Element by Direct Approach	3 - 7
3.5	Derivation of Stiffness Matrix of Bar Element by using Potential Energy Approach	3 - 9
3.6	Stiffness Matrix	3 - 11
3.7	Assembly of Global Stiffness Matrix and Load Vector	3 - 12
3.7.1	Properties of Stiffness Matrix	3 - 13
3.7.2	Half Bandwidth	3 - 13
3.7.3	Boundary Conditions	3 - 14
3.7.3.1	Elimination Method	3 - 14
3.7.3.2	Penalty Approach.....	3 - 15
3.7.3.3	Symmetric Boundary Conditions	3 - 16
3.8	Formulation for Elemental Stiffness Matrix and Load Vector for spring	3 - 17
3.9	Formulation for Elemental Stiffness Matrix and Load Vector for Bar	3 - 23
3.9.1	Derivation of Elemental Stiffness Matrix for Bar Element using Principle of Minimum Potential Energy Method	3 - 23
3.9.2	Derivation of Strain Displacement Matrix (B-Matrix), Strain Matrix and Stress Matrix for 1D Bar Element	3 - 25
3.9.3	Derivation of Load Vector due to Body Forces for 1D Bar Element	3 - 27
3.9.4	Derivation of Load Vector due to Traction Force (or Surface Force) for 1D Bar Element	3 - 28
3.9.5	Effect of Temperature on the Strain.....	3 - 29
3.10	Quadratic Bar Element.....	3 - 29
3.10.1	Derivation of Strain Vector and Stress Vector for 1D Quadratic Bar Element	3 - 30
3.10.2	Derivation of Stiffness Matrix for Quadratic Bar Element.....	3 - 31
3.10.3	Derivation of Load Vector due to Body Force for Quadratic Bar Element .	3 - 33
3.11	Solved Examples.....	3 - 34
3.12	Beams.....	3 - 45
3.12.1	Types of Beams.....	3 - 45

3.12.2 Transverse Loading on Beams	3 - 46
3.13 Derivations of Hermite Shape Functions for Beam Element	3 - 47
3.13.1 Formulation of Elemental Stiffness Matrix and Load Vector for Beam.....	3 - 51
3.13.2 Derivation of Load Vector due to Uniformly Distributed Load (UDL).....	3 - 55
3.14 Solved Examples.....	3 - 56
3.15 Truss Element.....	3 - 62
3.16 Formulation of Elemental Stiffness Matrix and Load Vector for Truss	3 - 62
3.16.1 Derivation of Elemental Stiffness Matrix for Truss.....	3 - 62
3.17 Derivation of Strain Matrix and Stress Matrix for Truss Element.....	3 - 63
3.18 Miscellaneous	3 - 64
3.18.1 Difference between Beam and Bar Element	3 - 64
3.18.2 Similarities between Beam and Bar Elements.....	3 - 64
3.18.3 Difference between Bar and Beam Element	3 - 65
3.18.4 Difference between Truss and Beam Element	3 - 65
3.18.5 Comparison between Bar, Beam and Truss Element	3 - 66
3.19 Solved Examples.....	3 - 67
3.20 Heat Transfer	3 - 76
3.20.1 Conduction Heat Transfer.....	3 - 76
3.20.2 Convection Heat Transfer	3 - 76
3.20.3 Radiation Heat Transfer	3 - 77
3.21 Governing Differential Equation	3 - 77
3.22 Boundary Conditions.....	3 - 78
3.22.1 Specified Temperature Boundary.....	3 - 78
3.22.2 Specified Heat Flux (or Insulated) and Convection.....	3 - 79
3.23 Steady State Heat Transfer Formulations of 1D Element for Conduction or Convection	3 - 80
3.23.1 Shape Functions for Linear Interpolations of Temperature Field.....	3 - 80
3.23.2 Strain-Displacement Matrix.....	3 - 83
3.23.3 Finite Element Formulation for Heat Conduction using Functional Approach (Variational Approach).....	3 - 84

3.23.4	Steps Involved in Finite Element Formulations for 1D Heat Transfer Problem	3 - 86
3.23.5	1D Heat Transfer in Pin Fin	3 - 87
3.23.6	Steps Involved in Finite Element Formulation of 1D Heat Transfer through Fin	3 - 88
3.23.7	Equation given by Galerkin for Heat Condition	3 - 90
3.23.8	Equation given by Galerkin for Combined Conduction and Convection	3 - 93
3.23.9	Boundary Conditions	3 - 95
3.24	Solved Examples.....	3 - 96
	Review Questions.....	3 - 101
	Multiple Choice Questions with Answers	3 - 101

Unit 4

Chapter - 4	2D Finite Element Analysis	(4 - 1) to (4 - 86)
4.1	Stress, Strain, Displacement and Loading	4 - 2
4.1.1	Introduction	4 - 2
4.1.2	Force Distribution	4 - 3
4.1.3	Stress Equilibrium Equations	4 - 4
4.1.4	Strain Displacement Relations	4 - 6
4.1.5	Stress - Strain Relations	4 - 8
4.1.5.1	Strain - Stress Relations in 3D	4 - 8
4.1.5.2	Stress - Strain Relations in 3D	4 - 9
4.1.5.3	Plane Stress Problem	4 - 11
4.1.5.4	Plane Strain Problem	4 - 12
4.2	Two Dimensional Vector Variable Problems	4 - 13
4.2.1	Degrees of Freedom	4 - 13
4.2.2	Rigid Body Matrix.....	4 - 13
4.2.3	Discrete Structures	4 - 13
4.2.4	Continuous Structures	4 - 14
4.2.5	Material Property	4 - 14

4.3 Theory of Elasticity.....	4 - 14
4.4 Axisymmetric Elements.....	4 - 19
4.4.1 Overview	4 - 19
4.4.2 Axisymmetric Formulations.....	4 - 20
4.4.3 Derivation of Shape Function for Axisymmetric Triangular Element (Triangular Element)	4 - 21
4.4.4 Strain Displacement Matrix [B] for Axisymmetric Triangular Element.....	4 - 26
4.4.5 Stress-Strain Relationship Matrix [D] for Axisymmetric Triangular Element.....	4 - 29
4.4.6 Temperature Effects	4 - 31
4.4.7 Belleville (Disk) Spring	4 - 31
4.5 Solved Examples.....	4 - 32
4.6 Two Dimensional Scalar Variables : Types of Elements.....	4 - 43
4.7 Formulation of Elemental Stiffness Matrix and Load Vector for Linear Strain Triangle.....	4 - 43
4.7.1 Derivation of Shape Function for LSR or Quadrilateral Element	4 - 44
4.7.2 Derivation of Strain-Displacement [B-Matrix] Matrix and Stress Matrix for LSR Element.....	4 - 47
4.7.3 Derivation of Stiffness Matrix for Quadrilateral Element.....	4 - 52
4.7.4 Derivation of Load Vector due to Body Force for Quadrilateral (LSR) Element	4 - 53
4.8 Formulation of Elemental Stiffness Matrix and Load Vectors for Constant Strain Triangle (CST) Element.....	4 - 56
4.8.1 Derivation of Shape Function for CST Element in Global Co-ordinates.....	4 - 57
4.8.2 Derivation of Shape Function for CST Element in Natural Co-ordinates ...	4 - 59
4.8.3 Derivation of B-Matrix, Strain Matrix and Stress Matrix for CST Element	4 - 61
4.8.3.1 Jacobian Matrix.....	4 - 62
4.8.4 Derivation of Stiffness Matrix for CST Element	4 - 65
4.8.5 Derivation of Load Vector due to Body Forces for CST Element	4 - 66
4.8.6 Derivation of Load Vector due to Traction Force for CST Element.....	4 - 67
4.9 Solved Numericals.....	4 - 70
4.10 Difference between CST and LST.....	4 - 73

4.11 Post Processing Techniques	4 - 74
4.11.1 Check and Validate Accuracy of Results	4 - 74
4.11.2 Appropriate Mesh Accuracy	4 - 75
4.11.3 Element Technology	4 - 75
4.11.4 Mesh Independence	4 - 75
4.11.5 Validation	4 - 76
4.12 Average and Un-average Stresses	4 - 76
4.13 Special Tricks for Post Processing.....	4 - 79
4.14 Interpretation of Results and Design Modifications	4 - 81
4.15 CAE Reports	4 - 84
4.15.1 Hard Copy	4 - 84
4.15.2 Soft Copy.....	4 - 85
4.15.3 Animation Files	4 - 85
Review Questions	4 - 85
Multiple Choice Questions with Answers	4 - 86

Unit 5

Chapter - 5	Non-Linear and Dynamic Analysis	(5 - 1) to (5 - 34)
5.1 Non-Linear Analysis.....		5 - 2
5.1.1 Introduction to Nonlinear Problems.....		5 - 2
5.2 Comparison of Linear and Nonlinear Analysis.....		5 - 3
5.3 Types of Nonlinearities		5 - 4
5.4 Stress-Strain Measures for Non-Linear Analysis.....		5 - 5
5.5 Analysis of Geometric		5 - 6
5.6 Material Nonlinearity.....		5 - 8
5.6.1 Yield Criteria, Yield Condition		5 - 9
5.6.2 Formulation of Materially Non-Linear Problems.....		5 - 9
5.7 Solution Techniques for Nonlinear Analysis		5 - 9
5.7.1 Direct Iteration.....		5 - 10
5.8 Newton Raphson Method.....		5 - 11

5.8.1	Convergence and Divergence in Newton-Raphson Method	5 - 13
5.9	Essential Steps in Nonlinear Analysis.....	5 - 14
5.10	Dynamic Analysis : Introduction to Dynamic Analysis	5 - 15
5.10.1	Dynamic Analysis Types	5 - 16
✓ 5.11	Comparison of Static and Dynamic Analysis	5 - 17
5.12	Time Domain and Frequency Domain.....	5 - 17
5.13	Types of Loading.....	5 - 19
5.14	Free Vibration..	5 - 19
5.14.1	A Vibratory System	5 - 20
5.14.2	Simple Harmonic Motion (SHM).....	5 - 23
5.14.3	Degrees of Freedom	5 - 25
5.14.4	Effects of Vibrations.....	5 - 27
5.15	Boundary Conditions of Free Vibration, Solution	5 - 27
	Review Questions.....	5 - 32
	Multiple Choice Questions with Answers	5 - 32

Unit 6

Chapter - 6 Applications of Computer Aided Engineering (6 - 1) to (6 - 44)

6.1	Computational Fluid Dynamics (CFD)	6 - 2
6.1.1	Three Dimensions of Fluid Dynamics	6 - 4
6.1.2	Equilibrium Equation for a Fluid.....	6 - 5
6.1.3	Conservation Form of Fluid Flow Equations.....	6 - 6
6.1.4	Integral Form of the Conservation Law	6 - 7
6.2	Injection Moulding of Plastics.....	6 - 9
6.2.1	Simplification of Mold Geometry for FEA.....	6 - 11
6.2.2	Material Model for Mold FEA.....	6 - 11
6.2.3	Boundary Conditions for Mold FEA	6 - 12
6.2.4	Loading of Mold in FEA.....	6 - 12
6.2.5	Results Analysis.....	6 - 12
6.3	Simulation for Manufacturing Processes like Casting	

and Sheet Metal Applications	6 - 13
6.3.1 Application of Casting Simulation Software	6 - 16
6.3.2 Sheet Metal	6 - 16
6.4 Durability Analysis	6 - 18
6.4.1 Durability	6 - 18
6.4.2 Reliability & Fatigue.....	6 - 18
6.4.3 Stress Life.....	6 - 19
6.4.4 Strain Life	6 - 20
6.5 Crash Analysis	6 - 22
6.5.1 Explicit Time Integration Schemes.....	6 - 25
6.5.2 Implicit Time Integration Scheme.....	6 - 26
6.6 Noise Vibration and Harshness (NVH) Analysis	6 - 28
6.6.1 NVH Concepts.....	6 - 28
6.6.2 NVH Terminology.....	6 - 30
6.6.3 FEA for Structural Dynamics	6 - 34
6.6.4 FEA for Acoustics	6 - 37
Review Questions.....	6 - 38
Multiple Choice Questions with Answers	6 - 39
Solved Model Question Papers	(M - 1) to (M - 4)
Solved SPPU Question Papers	(S - 1) to (S - 8)

Text Books For T.E. (MECH) SEM VI

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1. Artificial Intelligence & Machine Learning (Anamitra Deshmukh-Nimbalkar, I. A. Dhote)
2. Computer Aided Engineering
(Anup Goel, Siddu S., Shaikh Ubaid, Ashish R. Pawar, Jayashri V. Chopade)
3. Design of Transmission Systems (Anup Goel)

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We take this opportunity to express our sincere thanks to Dineshbhai Furia of Nirali Prakashan, a reputed pioneer in the publication field. Our special thanks to Jignesh Furia for their effective cooperation and great care in bringing out this revised edition. We also appreciate the efforts of M. P. Munde and the entire staff of Engineering Books Deptt. of Nirali Prakashan namely Mrs. Deepali Lachake (Co-ordinator) for bringing this book to the students in a timely manner.

We sincerely hope that this "**Second Edition**" will also be warmly received by all concerned as in the past.

Valuable suggestions from our esteemed readers to improve the book are most welcome and highly appreciated.

Pune

Authors

PREFACE TO THE FIRST EDITION

It gives us great pleasure in presenting this book on "**Basic Electronics Engineering**" for the Students of First Year Degree Courses in Engineering. This book is strictly written According to **Choice Based Credit System Syllabus** of Savitribai Phule Pune University revised in 2019.

In Choice Based Credit System, Two Examinations will be conducted. The First In-Semester Examination of 30 Marks will be based on first two units. i.e. Unit I & II and the End-Semester Examination of 70 Marks will be based on remaining four units. i.e. Unit III, IV, V and VI. Both of this Examinations will be descriptive type.

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The subject matter in the book is presented in a lucid, fluent and comprehensive manner from examination point of view. Illustrative Figures, Exercise and Various types of Solved Examples have been added as per the need. Also University Questions for Practice are given at the end of each unit. Also we have given **Model Question Papers** for practice at the end of book.

We take this opportunity to express our sincere thanks to Shri. Dineshbhai Furia, Shri. Jignesh Furia, Mrs. Nirali Verma and Shri. M. P. Munde and entire team of Nirali Prakashan namely Mrs. Deepali Lachake (Co-ordinator) who really have taken keen interest and untiring efforts in publishing this text.

Finally, we express our gratitude to our family members for their continuous support and encouragement, thanks to all.

We have no doubt that like our earlier texts, student's community will respond favourably to this new venture.

The advice and suggestions of our esteemed readers to improve the text are most welcomed, and will be highly appreciated.

August 2019

Pune.

Author

SYLLABUS

Unit I : Introduction to Electronics

(8 Hrs)

Evolution of Electronics, Impact of Electronics in industry and in society. Introduction to active and passive components, P-type Semiconductor, N-type Semiconductor. Current in semiconductors(Diffusion and Drift Current)

P-N Junction Diode: P-N Junction diode construction and its working in forward and reverse bias condition, V-I characteristics of P-N junction Diode, Diode as a switch, Half Wave Rectifier, Full wave and Bridge Rectifier.

Special purpose diodes: Zener diode, Light Emitting Diode (LED) and photo diode along with V-I characteristics and their applications.

Unit II : Transistor and OPAMP

(7 Hrs)

Bipolar Junction Transistor : Construction, type, Operation, V-I Characteristics, region of operation, BJT as switch and CE amplifier

Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier.

Operational amplifier: Functional block diagram of operational amplifier, ideal operational amplifier, Op-amp as Inverting and Non inverting amplifier

Unit III : Number System and Logic Gates

(7 Hrs)

Number System:- Binary, BCD, Octal, Decimal, Hexadecimal their conversion and arithmetic, De-Morgan's theorem.

Basic Gates:- AND, OR, NOT, Universal Gate- XOR, XNOR, Half adder, Full adder

Flip Flop's SR, JK, T and D

Introduction to Microprocessor and Microcontroller (Only block diagram and explanation)

Unit IV : Electronic Instrumentation

(6 Hrs)

Electronic Instruments: Principles and block diagram of digital multimeter, Function Generator, Digital Storage Oscilloscope (DSO) Power scope, AC/DC power supply, Auto transformer, Analog ammeter and voltmeter.

Unit V : Sensors

(7 Hrs)

Classification of a sensors, Active /Passive Sensors, Analog/Digital Sensors, Motion Sensors (LVDT, Accelerometer), Temperature Sensors (Thermocouple, Thermistor, RTD), Semiconductor Sensors(Gas Sensors), Optical Sensors (LDR), Mechanical Sensors (Strain Guage, Load Cell, Pressure sensors), Biosensors. (Working Principle and one application).

Unit VI : Communication Systems

(7 Hrs)

Basic Communication System: Block Diagram, Modes of Transmission, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Allotment of frequency band for different applications, Block Diagram of AM and FM Transmitter and receiver,

Mobile Communication System: Cellular concept, Simple block diagram of GSM system.

CONTENTS

Unit I : Introduction to Electronics

1.1 - 1.34

1.1	Evolution of Electronics	1.1
1.2	Impact of Electronics in Industry and Society	1.1
1.3	Introduction to Active and Passive Components	1.2
1.4	P-Type Semiconductor, N-Type Semiconductor	1.2
1.4.1	Effect of Temperature on Conduction of Semiconductors (Intrinsic)	1.4
1.5	Current in Semiconductors (Diffusion and Drift Current)	1.5
1.6	P-N Junction Diode	1.8
1.6.1	P-N Junction Diode	1.8
1.6.2	P-N Junction Diode Construction and its Working in Forward and Reverse Bias Condition	1.8
1.6.3	Biassing of a Diode	1.9
1.6.4	Forward V-I Characteristic of P-N Junction Diode	1.9
1.6.5	Forward Resistance of Diode	1.10
1.6.6	P-N Junction Diode in Reverse Biased Mode	1.10
1.6.7	Breakdown in a Reverse Biased Diode	1.10
1.7	Reverse Characteristics of Diode	1.11
1.7.1	Reverse Resistance of Diode	1.11
1.8	V-I Characteristics of the Typical Silicon and Germanium Diodes	1.11
1.8.1	Ideally Diode as a Switch in Forward and Reverse Bias	1.12
1.9	Block Diagram of D.C. Regulated Power Supply Explanation	1.12
1.10	Half Wave Rectifier (HWR)	1.13
1.11	Center Tapped Full Wave Rectifier (CTFWR)	1.17
1.12	Bridge Full Wave Rectifier (BFWR)	1.21
1.13	Special Purpose Diodes	1.26
1.13.1	Zener Diode	1.26
1.13.2	Light Emitting Diode (LED) and Photo Diode Along with V- I Characteristics and their Applications	1.29
1.13.3	Photodiode	1.31
•	Exercise	1.32
•	University Questions	1.33

Unit II : Transistor and OPAMP

2.1 - 2.30

2.1	Introduction	2.1
2.2	Bipolar Junction Transistor	2.1
2.3	Construction of Bipolar Junction Transistor (BJT)	2.1
2.3.1	Transistor Analogy by Two Diodes	2.2
2.3.2	An Unbiased Transistor	2.2
2.3.3	Biassing of a Transistor	2.4
2.4	Working of N-P-N Transistor in Active Region	2.4
2.5	Working of P-N-P Transistor in Active Region	2.4

2.6	Conventional Current Directions in the N-P-N and P-N-P Transistors	2.4
2.7	Common Emitter Configuration	2.5
2.7.1	Input Characteristics of Common Emitter Configuration	2.5
2.7.2	Output Characteristics in CE Configuration	2.5
2.8	Relationship Between α_{DC} and β_{DC}	2.6
2.9	Comparison of CB, CE and CC Configurations	2.7
2.10	Why CE Configuration is Widely Preferred?	2.7
2.11	Transistor Biasing and DC Analysis	2.7
2.11.1	The D.C. Operating Point and D.C. Load Line	2.9
2.12	Selection of Operating Point	2.10
2.13	Important Conditions for Biasing	2.11
2.14	Bias Stabilization	2.11
2.14.1	Fixed Bias	2.11
2.14.2	Self Bias or Voltage Divider Bias	2.12
2.15	BJT as a Switch	2.13
2.16	Transistor as an Amplifier	2.14
2.16.1	Single Stage BJT Amplifier	2.14
2.16.2	Regions of Operation	2.15
2.16.3	Region of Operation	2.16
2.17	Metal Oxide Semiconductor Field Effect Transistors (MOSFET)	2.17
2.18	MOSFET	2.17
2.19	Enhancement MOSFET (EMOSFET)	2.17
2.19.1	Construction of EMOSFET	2.17
2.19.2	Characteristics of N-Channel EMOSFET	2.18
2.20	P-Channel EMOSFET	2.18
2.20.1	Regions of Operation	2.19
2.20.2	MOSFET as Switch	2.19
2.20.3	MOSFET as an Amplifier	2.19
2.21	Operational Amplifier	2.21
2.22	OP-AMP IC 741	2.21
2.22.1	Power Supply Connections	2.21
2.22.2	Ideal Operational Amplifier	2.22
2.23	Equivalent Circuit of an Op-Amp	2.22
2.23.1	Feedback	2.23
2.23.2	Closed Loop Configuration of Op-Amp	2.24
2.23.3	Op-Amp as Inverting	2.24
2.23.4	Analysis of Inverting Amplifier Circuit	2.24
2.23.5	Non Inverting Amplifier	2.26
•	Exercise	2.27
•	University Questions	2.28

Unit III : Number System and Logic Gates

- 3.1 Introduction to Number Systems
 - 3.1.1 Decimal Number System
 - 3.1.2 Binary Number System
 - 3.1.3 Octal Number System
 - 3.1.4 Hexadecimal Number Systems
 - 3.1.5 Weighted and Non-Weighted Codes
- 3.2 Number Conversions
- 3.3 Decimal to Octal Conversion
- 3.4 Decimal to Hexadecimal Conversion
- 3.5 Binary to Decimal Conversion (Others to Decimal)
- 3.6 Octal to Decimal Conversion
- 3.7 Hexadecimal to Decimal Conversion
- 3.8 Octal to Binary Conversion
- 3.9 Binary to Octal Conversion
- 3.10 Hexadecimal to Binary and Binary to Hexadecimal Conversion
- 3.11 Hexadecimal to Binary Conversion
- 3.12 Binary to Hexadecimal Conversion
- 3.13 Hexadecimal to Octal and Octal to Hexadecimal Conversion
- 3.14 Hexadecimal to Octal Conversion
- 3.15 Octal to Hexadecimal Conversion
- 3.16 Arithmetic Operations
 - 3.16.1 Binary Addition
 - 3.16.2 Binary Subtraction
 - 3.16.3 Binary Multiplication
 - 3.16.4 Binary Division
- 3.17 Binary Coded Decimal (BCD)
 - 3.17.1 Decimal to BCD Conversion
 - 3.17.2 BCD to Decimal Conversion
- 3.18 BCD Addition
- 3.19 Subtraction Using Complements
 - 3.19.1 1's Complement Representation
 - 3.19.2 2's Complement Representation
 - 3.19.3 Subtraction using Complement
- 3.20 Boolean Algebra
- 3.21 Demorgan's Theorem
- 3.22 Logic Gates
- 3.23 Half Adder
- 3.24 Full Adder
- 3.25 Flip-Flop
- 3.26 Introduction to Microprocessor
- Exercise
- University Questions

Unit IV : Electronic Instrumentation**4.1 – 4.14**

4.1	Introduction	4.1
4.2	Digital Multimeter	4.2
4.2.1	Comparison between Analog and Digital Multimeter	4.3
4.3	Function Generator	4.3
4.4	Digital Storage Oscilloscope (DSO)	4.5
4.5	Power Scope (PX8000)	4.6
4.5.1	Block Diagram	4.6
4.6	Power Supply	4.8
4.6.1	Limitations of Ordinary DC Power Supply	4.9
4.7	Auto Transformer	4.10
4.8	Analog Voltmeter and Ammeter	4.11
4.8.1	Difference between Ammeters and Voltmeters	4.13
•	Exercise	4.14

Unit V : Sensors**5.1 – 5.20**

5.1	Introduction	5.1
5.2	Classification of Sensors	5.2
5.3	Active and Passive Sensors	5.2
5.4	Analog and Digital Sensors	5.3
5.5	Motion Sensor	5.3
5.5.1	Linear Variable Differential Transformer (LVDT)	5.4
5.5.2	Accelerometer	5.5
5.6	Temperature Sensors	5.7
5.6.1	Thermocouple	5.7
5.6.2	Thermistors	5.8
5.6.3	Resistance Temperature Detector (RTD)	5.10
5.7	Semiconductor Sensor	5.11
5.7.1	Gas Sensors	5.11
5.8	Optical Sensors	5.11
5.8.1	Light Dependent Resistor (LDR) or Photoresistor	5.11
5.9	Mechanical Sensors	5.14
5.9.1	Strain Gauges	5.15
5.9.2	Load Cell	5.16
5.9.3	Pressure Sensors	5.18
5.10	Biosensor	5.19
•	Exercise	5.19
•	University Questions	

Unit VI : Communication Systems

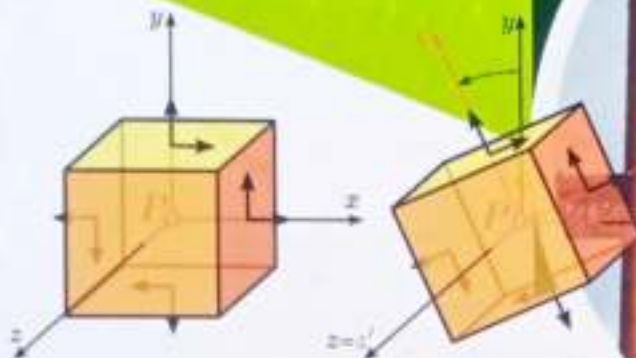
6.1	Introduction	6.1
6.1.1	Block Diagram of Communication System	6.2
6.2	Modes of Transmission	6.2
6.3	Communication Media	6.2
6.3.1	Wired Communication	6.3
6.3.2	Transmission Lines	6.3
6.3.3	Parallel Wires Transmission Line	6.3
6.3.4	Twisted Pair Cables	6.4
6.3.5	Coaxial Cable	6.5
6.3.6	Fibre Optic Cable	6.5
6.3.7	Comparison of Wired Media	6.6
6.3.8	Wireless Communication	6.6
6.4	Electromagnetic Spectrum	6.8
6.5	Radio Frequency Spectrum and its Applications	6.8
6.6	Modulation Techniques	6.10
6.6.1	Necessity of Modulation (Need for Modulation)	6.10
6.6.2	Types of Modulation	6.12
6.6.3	Comparison of AM and FM	6.12
6.6.4	AM Transmitters and Receiver	6.13
6.7	FM Transmitters and Receiver	6.15
6.8	Cellular Concept	6.16
6.9	GSM System	6.16
•	Exercise	6.16
•	University Questions	6.17
		6.17

• **Model Question Papers (For In-Sem Exam. and End-Sem. Exam.)**



According to New Revised Credit System Syllabus

SPPU







Second Year (S.E.) Degree Course In
MECHANICAL ENGINEERING (Semester - I)

SOLID MECHANICS



Dr. UTTAM R. AWARI
Dr. JYOTI P. BHUSARI
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Dr. UTTAM R. AWARI

Ph.D (Civil Engg.),
Asso. Professor & Head Deptt. of Civil Engg.,
A2SSMS College of Engineering,
PUNE.

Dr. JYOTI P. BHUSARI

Ph.D (Civil Engg.),
Professor, Deptt. of Civil Engg.,
Sinhgad College of Engineering,
Vadgaon (Bk) PUNE.

Dr. GIRISH L. ALLAMPALLEWAR

Ph.D (Mechanical Engg.)
Assistant Professor, Deptt. of Mechanical Engg.,
Marathwada Mitramandal's Inst. of Tech.,
Lohagaon, PUNE

Dr. KASHINATH H. MUNDE

Ph.D (Mechanical Engg.)
Professor, Deptt. of Mechanical Engg.,
ABMSP'S Anantrao Pawar College of Engg. & Research
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PREFACE

It gives us great pleasure to present the book '**Solid Mechanics**' for the students of Second Year Degree Course in Mechanical Engineering of the Savitribai Phule Pune University. This book is strictly as per the **New Revised Credit System Syllabus 2019** Pattern with effect from the Academic Year 2020-2021.

In Choice Based Credit System, Two Examinations will be conducted. The First In-Semester Examination of 30 Marks will be based on first two units, i.e. Unit I and II and the End-Semester Examination of 70 Marks will be based on remaining four units, i.e. Unit III, IV, V and VI. Both of this Examinations will be descriptive type.

The Theory Course will have 5 Credits.

The book is written such that all the basic concepts are explained in a simplified manner. It is presented in a more conceptual manner rather than mathematical, as required by the new examination system. It is our objective to keep the presentation systematic, consistent, intensive and clear through explanatory notes and figures.

Main feature of this book is, Complete Coverage of the New Credit System Syllabus with large number of Worked Solved Examples, Exercises, Model Question Papers of In Sem. and End Sem. Exams.

We are sure that this book will cater to all needs of students for this subject.

We also take this opportunity to express our sincere thanks to Shri. Dineshbhai Furia, Shri. Jignesh Furia, Mrs. Nirali Verma and entire team of Nirali Prakashan, namely Mrs. Deepali Lachake (Co-ordinator), who really have taken keen interest and untiring efforts in publishing this text.

We would like to make a special mention of the valuable contribution made by late Shri M.P. Munde in his continuous efforts during the last two decades, in making the text popular among students and teachers. Without his perseverance and zeal, successive editions would not have been possible.

The advice and suggestions of our esteemed readers to improve the text are most welcome, and will be highly appreciated.

Unit I: Simple Stresses and Strains

- 1.1 Introduction
 - 1.2 Stress
 - 1.2.1 Tensile Stress
 - 1.2.2 Compressive Stress
 - 1.2.3 Shear Stress
 - 1.3 Strain
 - 1.3.1 Linear Strain
 - 1.3.2 Lateral Strain
 - 1.3.3 Volumetric Strain
 - 1.3.4 Shear Strain
 - 1.4 Poisson's Ratio
 - 1.5 Principle of Complementary Shear Stress
 - 1.6 Relationship Between Stresses and Strains
 - 1.6.1 Elasticity and Elastic Limit
 - 1.6.2 Stress Strain Curve for Ductile Material
 - 1.6.3 Stress Strain Curve for Brittle Material
 - 1.6.4 Working Stress
 - 1.6.5 Factor of Safety
 - 1.7 Change in Length of Bar of Uniform Section
 - 1.8 Axial Flexibility and Stiffness
 - 1.8.1 Axial Flexibility
 - 1.8.2 Axial Stiffness
 - 1.9 Elongation of a Bar Due to Self Weight
 - 1.9.1 Elongation of Bar of Uniform Cross Section due to Self Weight
 - 1.9.2 Elongation of Conical Bar due to Self Weight
 - 1.10 Elongation of Uniformly Tapering Circular Rod
 - 1.11 Elongation of Uniformly Tapering Rectangular Bar
 - 1.12 Elastic Constants
 - 1.12.1 Relation between E & G
 - 1.12.2 Relation between E and K
 - 1.12.3 Relation between E , G , K
 - 1.13 Volumetric Strain of a Cylindrical Rod
 - 1.14 Volumetric Strain of a Rectangular Bar
 - 1.14.1 Volumetric Strain of a Rectangular Bar Subjected to Uniaxial Load
 - 1.14.2 Volumetric Strain of a Rectangular Bar Subjected to Three Mutually Perpendicular Forces - Triaxial Loading
 - 1.15 Stresses in Statically Indeterminate Structures
 - 1.16 Temperature Stress and Strain
 - 1.16.1 Change in Length due to Temperature
 - 1.16.2 Members in Series
 - 1.16.3 Members in Parallel
- **Exercise**

Unit II: Shear Force and Bending Moment Diagram	2.1-2.36
2.1 Introduction	2.1
2.2 Shear Force and Bending Moment	2.1
2.2.1 Definition and Sign Conventions for Shear Force and Bending Moment	2.1
2.3 Shear Force and Bending Moment Diagrams (SFD and BMD)	2.2
2.4 Relationship Between Load, Shear and Bending Moment	2.7
2.5 Bending Moment and Loading Diagram from Given Shear Force Diagram	2.22
2.5.1 Special Case : To Obtain the BMD from SFD Directly Without Loading Diagram	2.24
• Exercise	2.26
Unit III: Stresses, Slope of Deflection on Beam	3.1-3.54
3.1 Bending Stress	3.1
3.2 Assumptions in Theory of Bending	3.1
3.3 Neutral Axis	3.2
3.4 Moment of Resistance	3.2
3.5 Section Modulus	3.3
3.6 Shear Stresses	3.13
3.7 Shear Connectors	3.17
3.8 Slope & Deflection of Beams and Trusses	3.25
3.9 Assumptions	3.25
3.10 Slope, Deflection and Radius of Curvature	3.25
3.11 Methods of Displacement Analysis	3.26
3.12 Macaulay's Method	3.26
3.13 Boundary Conditions	3.26
3.14 Sign Conventions	3.26
3.15 Bending Moment Equations for Macaulay's Method	3.26
• Exercises	3.45
Unit IV: Torsion, Buckling	4.1-4.46
4.1 Introduction	4.1
4.2 Basics of Torsion	4.1
4.3 Method of Section	4.1
4.3.1 Torsional Moment Diagram	4.1
4.4 Theory of Torsion	4.2
4.4.1 Assumptions in Deriving the Torsion Formulae	4.2
4.4.2 Derivation of Torsion Formula	4.2
4.5 Basic Terms	4.3
4.5.1 Torsional Stiffness	4.3
4.5.2 Torsional Flexibility	4.3
4.5.3 Torsional Rigidity	4.3
4.5.4 Torsional Section Modulus	4.3
4.5.5 Power Transmitted by Shaft	4.4
4.6 Design of Shafts	4.6
4.7 Solid and Hollow Circular Shafts	4.6
4.8 Shafts in Series	4.11

4.9	Statically Indeterminate	4.9
4.9.1	Shafts Fixed at Both Ends	4.9
4.9.2	Shafts in Parallel	4.9
4.10	Buckling of Columns: Introduction	4.9
4.11	Critical Load	4.9
4.12	Euler's Theory of Long Columns	4.9
4.12.1	When Both Ends are Pinned or Hinged	4.9
4.12.2	When One End is Fixed and the Other is Free	4.9
4.12.3	When Both Ends of the Column are Fixed	4.9
4.12.4	When One End Fixed and the Other End is Pinned	4.9
4.13	Effective Length of a Column	4.9
4.14	Limitations to Euler's Formula	4.9
4.15	Rankine's Formula	4.9
•	Exercise	4.9

Unit V: Principal Stresses, Theories of Failure

5.1-5.31

5.1	Introduction: Principal Stress and Strains	5.1
5.2	Transformation of Plane Stress	5.1
5.3	Principal Stresses	5.2
5.4	Maximum Shear Stress	5.3
5.5	Mohr's Circle	5.12
5.6	Introduction: Theories of Failure	5.17
5.7	Yield Criteria	5.17
5.8	Theories of Failure	5.17
5.9	Maximum Principal Stress Theory	5.17
5.10	Maximum Shear Stress Theory	5.18
5.11	Maximum Principal Strain Theory	5.19
5.12	Maximum Strain Energy Theory	5.21
5.13	Maximum Shear Strain Theory	5.21
5.14	Mohr's Theory of Failure	5.21
•	Exercise	5.28

Unit VI: Application Based Combined Loading and Stresses

6.1-6.18

6.1	Introduction	6.1
6.2	Method of Analysis	6.1
6.3	Method of Superposition	6.1
6.4	Combined Bending and Direct Stresses	6.11
•	Exercise	6.18

• Model Question Papers

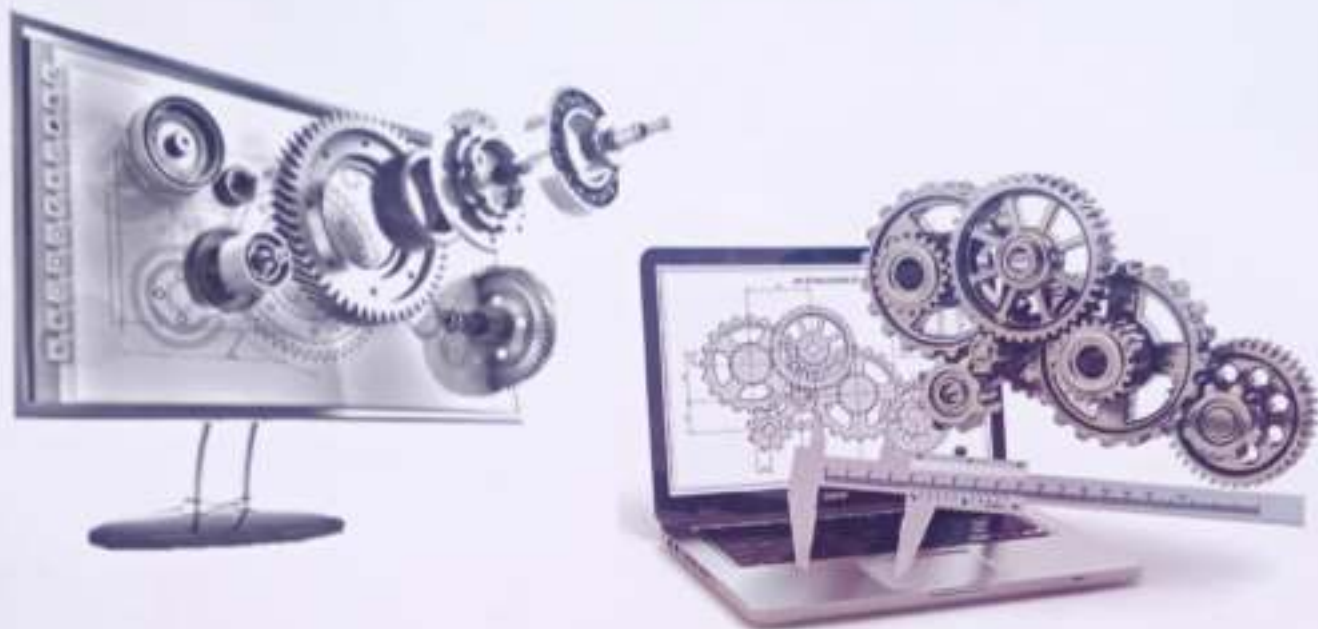
➤ In-Sem. Exam. (30 Marks)

P.1 - P.2

➤ End-Sem. Exam. (70 Marks)

P.3 - P.4





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Semester - VI (Mechanical) Professional Elective - II

COMPUTER AIDED MANUFACTURING

Dr. Subhash L. Gadhave

Ph.D. (Mech), M.E. Mech. (Mechatronics),
Associate Professor in Mechanical Engg. Dept.,
Dr. D.Y. Patil Institute of Technology, Pimpri.

Dr. Kashinath H. Munde

Ph. D. (Vibration Analysis),
CIIR-IITD, LMISTE
Professor
Mechanical Engineering Department
ABMSP's Anantao Pawar College
of Engineering and Research,
Parvati, Pune



TABLE OF CONTENTS

Chapter - 1 CAM : Computer Aided Manufacturing (1 - 1) to (1 - 18)

1.1	Introduction to Computer Aided Manufacturing (CAM)	1 - 2
1.1.1	Definition : Computer Aided Manufacturing (CAM)	1 - 2
1.1.2	Objective of CAM	1 - 2
1.1.3	History of CAM	1 - 2
1.1.3.1	Overcoming the Historical Shortcomings of CAM	1 - 3
1.1.4	Components of Computer Aided Manufacturing	1 - 3
1.2	Manufacturing System	1 - 4
1.2.1	Types of Manufacturing Systems	1 - 4
1.2.2	Modern Manufacturing Systems	1 - 7
1.3	Benefits or Advantages of Computer-Aided Manufacturing	1 - 8
1.4	Role of Management in CAM	1 - 9
1.5	Introduction to Computer Integrated Manufacturing (CIM)	1 - 9
1.5.1	Evolution of CIM	1 - 10
1.5.2	Definition of CIM	1 - 11
1.5.3	Objective of CIM	1 - 11
1.5.4	CIM Hardware and CIM Software	1 - 11
1.5.5	Nature and Role of the CIM System	1 - 11
1.6	CIM Wheel	1 - 13
1.6.1	Strengths of CIM Wheel	1 - 14
1.6.2	Weakness of the CIM Wheel	1 - 14
1.7	Benefits of CIM	1 - 14
	Review Questions	1 - 15
1.8	Short Questions and Answers	1 - 15
1.9	University Questions with Answers	1 - 16

Chapter - 2 NC/CNC Machine Tools (2 - 1) to (2 - 70)

2.1	Introduction to NC Machines	2 - 2
-----	-----------------------------------	-------

2.1.1	Definitions of Numerical Control (NC)	2 - 2
2.1.2	Basic Components of NC Machines	2 - 2
2.1.3	Classification of NC Systems	2 - 3
2.1.4	Advantages of NC Machine Tools	2 - 6
2.1.5	Limitations of NC Machine Tools	2 - 7
2.1.6	Applications of NC Machine	2 - 7
2.2	Computerized Numerical Control (CNC) Machine Tool	2 - 7
2.2.1	Basic Elements of CNC System	2 - 8
2.2.2	Classification of CNC Machines Tool Systems	2 - 9
2.2.3	CNC Manufacturing Process	2 - 12
2.2.4	Advantages of a CNC Machine	2 - 12
2.2.5	Limitations of CNC	2 - 13
2.2.6	Applications of CNC	2 - 13
2.2.7	Typical Specification of a CNC System	2 - 13
2.3	Comparison between NC, CNC and DNC Machine Tools	2 - 14
2.4	CNC Machining Centers	2 - 15
2.4.1	Classification of Machining Centres	2 - 15
2.4.2	Features of CNC Machining Centers	2 - 15
2.5	CNC Hardware	2 - 16
2.5.1	Recirculating Ball Screw	2 - 16
2.5.1.1	Advantages of Recirculating Ball Screws	2 - 17
2.5.1.2	Disadvantages of Recirculating Ball Screws	2 - 17
2.5.1.3	Applications of Recirculating Ball Screws	2 - 17
2.5.2	Slideways	2 - 17
2.5.3	CNC Drives	2 - 18
2.5.3.1	Power Drives	2 - 19
2.5.3.2	Electrical Drives	2 - 19
2.6	Axes Designation	2 - 21
2.6.1	Right-Hand Rule (Vertical Milling Machine)	2 - 22

2.7	Introduction to Part Programming	2 - 22
2.7.1	Steps in Part Programming	2 - 23
2.7.2	Methods of Part Programming	2 - 23
2.7.3	Terminology Used in Part Programming	2 - 24
2.8	Preparatory Functions (G codes)	2 - 26
2.8.1	Commonly used G-codes	2 - 27
2.9	M-Codes (Miscellaneous Functions)	2 - 29
2.10	Tape Programming Format	2 - 29
2.11	Part Programming for Drilling Operation	2 - 30
2.12	Manual Part Programming For Turning Applications : Turning Centre	2 - 32
2.12.1	Cutting Process Parameter Selection for Turning Applications	2 - 32
2.13	Part Programming For Milling Machine Operation	2 - 39
2.14	Fixed Cycle/Canned Cycle	2 - 46
2.15	DO-LOOPS	2 - 50
2.16	Subroutine	2 - 52
2.17	Computer-Assisted Part Programming	2 - 53
2.17.1	Types of Computer-Assisted Part Programming Languages	2 - 53
2.17.2	Components (Elements) of Computer Assisted Programming System	2 - 54
2.18	APT (Automatically Programmed Tools)	2 - 55
2.18.1	APT Language	2 - 56
2.19	Types of Statements in APT Language	2 - 56
2.19.1	Geometry Statements	2 - 56
2.19.2	Motion Statements	2 - 60
2.19.3	Postprocessor Statements	2 - 62
2.19.4	Auxiliary Statements	2 - 62
	Review Questions	2 - 63
2.20	Short Questions and Answers	2 - 64
2.21	University Questions with Answers	2 - 66

Chapter - 3 Programmable Logic Controller (3 - 1) to (3 - 24)

3.1	Introduction to PLC	3 - 2
-----	---------------------	-------

3.1.1	Definition of PLC	3 - 2
3.1.2	Features of PLC	3 - 2
3.2	Basic Components of PLC	3 - 3
3.3	Internal Architecture of PLC System	3 - 3
3.4	Advantages of PLC Over the Relay System	3 - 3
3.5	Disadvantages of PLC	3 - 3
3.6	Application of PLC	3 - 3
3.7	Relay Device Components	3 - 3
3.7.1	Switches (Contact)	3 - 3
3.7.2	Relays	3 - 3
3.7.3	Timer	3 - 3
3.7.4	Counters	3 - 3
3.8	PLC Programming	3 - 3
3.8.1	Ladder Diagram	3 - 3
3.8.1.1	Fundamental of Ladder Diagram	3 - 3
3.8.2	Logic Functions	3 - 3
3.8.3	Input / Output Processing	3 - 3
3.8.3.1	Steps Involved in Input / Output Processing	3 - 3
3.8.4	Latching	3 - 3
3.8.5	Mnemonics used in PLC	3 - 3
3.9	Tools for PLC Logic Design	3 - 3
3.9.1	Design using a Truth Table	3 - 3
	Review Questions	3 - 3
3.10	Short Questions and Answers	3 - 3
3.11	University Questions with Answers	3 - 3

Chapter - 4 Group Technology and CAPP (4 - 1) to (4 - 30)

4.1	Introduction to Group Technology (GT)	4 - 2
4.1.1	Definition of Group Technology (GT)	4 - 2
4.1.2	Objective of GT	4 - 2
4.1.3	Obstacle to the Application of GT	4 - 2
4.1.4	Advantages of Group Technology	4 - 2
4.1.5	Benefits of GT	4 - 2
4.2	Types of Layout	4 - 3

4.3	Part Families	4 - 4
4.4	Methods for Grouping Part into Family	4 - 6
4.5	Parts Classification and Coding	4 - 6
4.5.1	Basic Coding Structures	4 - 7
4.6	Optiz System	4 - 8
4.7	MIClass Classification and Coding System ..	4 - 12
4.8	Production Flow Analysis (PFA)	4 - 13
4.8.1	Rank Order Clustering	4 - 14
4.9	Machine Cell Designs (Types of GT Cells) ..	4 - 15
4.10	Composite Part Concept	4 - 18
4.11	Introduction to Process Planning	4 - 18
4.11.1	Approaches to Process Planning	4 - 19
4.11.1.1	Manual Experience-based Process Planning	4 - 19
4.11.1.2	Computer-Aided Process Planning (CAPP)	4 - 19
4.11.1.3	Steps Involved in CAPP	4 - 20
4.12	Approaches to Computer-Aided Process Planning	4 - 21
4.12.1	Types of CAPP Approaches	4 - 21
4.13	Recent Trends in CAPP	4 - 25
4.14	Difference between Generative CAPP and Variant CAPP System	4 - 25
4.15	Benefits of CAPP	4 - 26
	Review Questions	4 - 26
4.16	Short Questions and Answers	4 - 27
4.17	University Questions with Answers	4 - 29

Chapter - 5 Flexible Manufacturing System (5 - 1) to (5 - 34)

5.1	Introduction of Flexible Manufacturing System (FMS)	5 - 2
5.1.1	Definition of FMS	5 - 2
5.1.2	Elements of Flexible Manufacturing System	5 - 2
5.1.3	Need of FMS	5 - 4

5.1.4	Objectives of FMS	5 - 4
5.1.5	Advantages of Flexible Manufacturing System (FMS)	5 - 5
5.1.6	Disadvantages of Flexible Manufacturing System FMS	5 - 5
5.1.7	Areas of Applications of FMS	5 - 6
5.2	Flexibility and its Types	5 - 6
5.2.1	Flexibility	5 - 6
5.2.2	Types of Flexibilities	5 - 7
5.3	Types of FMS	5 - 8
5.4	Layout Configurations of Flexible Manufacturing System	5 - 9
5.5	Automated Material Handling System	5 - 12
5.5.1	Material-handling System	5 - 12
5.5.2	Principles of Material Handling	5 - 12
5.5.3	Material Handling Equipment	5 - 13
5.6	Automated Storage/Retrieval Systems	5 - 13
5.6.1	Introduction to Automated Storage/Retrieval Systems	5 - 13
5.6.2	Definition of AS/RS	5 - 13
5.6.3	Objectives Automated Storage System ..	5 - 13
5.6.4	AS/RS Components and Terminology ...	5 - 14
5.6.5	Types of AS/RS	5 - 15
5.6.6	Design of an AS/RS	5 - 16
5.7	Automated Guided Vehicles	5 - 16
5.7.1	Introduction to Automated Guided Vehicles (AGVs)	5 - 16
5.7.2	Components of AGVs	5 - 17
5.7.3	Different Types of AGVs	5 - 17
5.7.4	AGVs Control Systems	5 - 18
5.7.5	Advantages of AGVs over the Material Handling System	5 - 19
5.7.6	Applications of AGVs	5 - 19
5.8	Introduction to Cellular Manufacturing	5 - 19
5.8.1	Definition: Cellular Manufacturing	5 - 20
5.8.2	Objectives of Cellular Manufacturing ...	5 - 20

5.8.3 Implementation of Cellular Manufacturing	5 - 20
5.8.4 Advantages of Cellular Manufacturing	5 - 20
5.8.5 Disadvantages of Cellular Manufacturing	5 - 22
5.9 Tool Management	5 - 22
5.10 Tool Management System	5 - 22
5.10.1 Tool Supply System	5 - 23
5.10.2 Tool Monitoring System	5 - 23
5.11 Flexible Fixturing	5 - 25
5.11.1 Types of Flexible Fixturing	5 - 25
5.12 Flexible Assembly System	5 - 26
5.12.1 How to Apply a Flexible Assembly System	5 - 27
5.12.2 Flexible Assembly Systems : Main Features	5 - 27
5.12.3 Benefits of Flexible Assembly Systems	5 - 27
5.13 Coordinate Measuring Machine (CMM)	5 - 27
5.13.1 Components of CMM	5 - 28
5.13.2 CMM Mechanical Structure	5 - 28
5.13.3 Advantages of CMM	5 - 28
5.13.4 Disadvantages of CMM	5 - 28
5.13.5 Uses of CMM	5 - 28
5.13.6 Role of CMM in Computer Aided Manufacturing	5 - 28
Review Questions	5 - 29
5.14 Short Questions and Answers	5 - 30
5.15 University Questions with Answers	5 - 31

Chapter - 6 Robot Technology (6 - 1) to (6 - 40)

6.1 Introduction to Robotics	6 - 2
6.2 Definition of Robot	6 - 2
6.3 Definition and Advantages of Robotics	6 - 2
6.3.1 Definition	6 - 2
6.3.2 Advantages	6 - 2
6.4 Robot Anatomy	6 - 3
6.4.1 Robot Links and Joints	6 - 3

6.4.2 Robot Motion	6 - 4
6.5 Laws of Robotics	6 - 5
6.6 Classification of Robots	6 - 6
6.7 Generation of Robots	6 - 10
6.8 Advantages and Disadvantages of Robots	6 - 11
6.9 Parameters in Robot Specifications and Selection of Robot	6 - 11
6.9.1 Typical Specification of Robot	6 - 12
6.10 Power Sources of Robots	6 - 12
6.11 Actuators for Robots	6 - 13
6.11.1 Comparison of Hydraulic, Electric and Pneumatic Actuators	6 - 17
6.12 Robot Sensors	6 - 18
6.12.1 Classification of Robot Sensor	6 - 18
6.13 Grippers	6 - 19
6.13.1 Types of Gripper	6 - 19
6.14 Robot Safety	6 - 26
6.15 Methods of Programming	6 - 26
6.16 Robot Programming Languages	6 - 28
6.17 Applications of Industrial Robots	6 - 29
6.18 Economic Considerations of Robotics System	6 - 31
6.18.1 Type of Robot Installation	6 - 31
6.18.2 Methods of Economic Evaluation of Investment	6 - 31
6.19 Robot Kinematics and Dynamics	6 - 32
6.19.1 Robot Kinematics	6 - 32
6.19.2 Kinematic Terminology	6 - 32
6.19.3 Forward and Inverse Kinematics	6 - 33
6.19.3.1 Forward Kinematics	6 - 33
6.19.3.2 Inverse Kinematics	6 - 33
6.19.3.3 Difference between Forward and Inverse Kinematics	6 - 33
6.19.4 Robot Dynamics	6 - 34
6.20 Concepts of Computer Vision and Machine Intelligence	6 - 34
Review Questions	6 - 36

6.21	Short Questions and Answers	6 - 36
6.22	University Questions with Answers	6 - 38

Chapter - 7 Integrated Production Management System (7 - 1) to (7 - 26)

7.1	Introduction to Integrated Production Management Systems (IPMS).....	7 - 2
7.2	Concept of Production Planning and Control	7 - 2
7.2.1	Definition of Production Planning and Control	7 - 2
7.2.2	Need of PPC	7 - 2
7.2.3	Objectives of PPC.....	7 - 3
7.2.4	Characteristics of Production Planning and Control	7 - 3
7.2.5	Functions of Production Planning and Control	7 - 3
7.2.6	Factors affecting Production Planning and Control	7 - 5
7.2.7	Advantages of Production Planning and Control	7 - 5
7.2.8	Limitations of Production Planning and Control	7 - 6
7.2.9	Problems with Production Planning and Control	7 - 6
7.3	Material Requirement Planning (MRP)	7 - 8
7.3.1	Introduction to MRP	7 - 8
7.3.2	MRP Objectives	7 - 8
7.3.3	MRP Terminology	7 - 8
7.3.4	MRP System	7 - 9
7.3.5	Advantages and Disadvantages of MRP	7 - 10
7.3.6	Implementation of Material Resource Planning	7 - 10
7.3.7	MRP-II [Manufacturing Resource Planning].....	7 - 10
7.3.8	Difference between MRP-I & MRP-II	7 - 11

7.4	Just In Time (JIT)	7 - 12
7.4.1	Definition of JIT.....	7 - 12
7.4.2	Objective of JIT	7 - 12
7.4.3	JIT as a Philosophy	7 - 12
7.4.4	Advantages of JIT	7 - 14
7.5	GT Concept Applied to Flexible Manufacturing System [FMS].....	7 - 15
7.6	Expert System	7 - 15
7.6.1	Expert System Definition	7 - 16
7.6.2	Components of Expert Systems	7 - 16
7.6.3	Characteristics of Expert Systems.....	7 - 16
7.6.4	Benefits of Expert Systems.....	7 - 17
7.6.5	Limitations of the Expert Systems	7 - 17
7.6.6	Differences between the Conventional System and the Expert System	7 - 17
7.6.7	Applications of Knowledge Based Systems in Manufacturing	7 - 17
7.7	Computer Integrated Production Management Systems (CIMPS)	7 - 19
7.8	Enterprise Resource Planning (ERP)	7 - 20
7.8.1	Definition of (ERP).....	7 - 21
7.8.2	ERP Characteristics.....	7 - 21
7.8.3	Features of ERP	7 - 21
7.8.4	ERP Modules	7 - 21
7.8.5	ERP Implementation Issues	7 - 22
7.8.6	Advantages of ERP Implementation.....	7 - 23
	Review Questions	7 - 24
7.9	Short Questions and Answers	7 - 24
7.10	University Questions and Answers	7 - 25

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Solved Model Question Paper (S - 20) to (S - 22)



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Quantity Surveying, Contracts and Tenders

(Code : 401012) (Compulsory Subject)

Semester VIII - Civil Engineering

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Dr. Chittaranjan B. Nayak

*Ph.D (Civil Engineering)
M. Tech. Civil (Structural Engineering)
Asst. Professor
Department of Civil Engineering
VPKBIET, Baramati,
Maharashtra, India.*

Dr. Sunil B. Thakare

*BE - Civil, ME - Environmental Engg. & Ph.D
Principal,
Anantrao Pawar College of Engineering and
Research, Parvati
Pune - 411009,
Maharashtra, India.*

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PREFACE

My dear students,

We are extremely happy to present the Book of **"Quantity Surveying, Contracts and Tenders"** for Civil Engineering students. This book has been strictly written as per the new syllabus of Savitribai Phule Pune University w.e.f academic year 2022-2023.

We have divided the syllabus into small chapters so that topics can be arranged and understood properly. The topics within the chapters have been arranged in proper sequence to ensure smooth flow of the subject.

Examples from university question papers upto the latest question papers have been solved chapter wise in this book. In addition to that answers to tricky theory university questions have also been included. So, we are sure that this book will cater all your needs for this subject.

We present this book in the loving memory of **Late Shri Pradeepji Lunawat**. Our source of inspiration and a strong foundation of **"TechKnowledge Publications"**. He will always be remembered in our heart and motivate us to achieve our new milestone.

We are thankful to **Mr. Shital Bhandari, Shri. Arunoday Kumar and Shri. Chandroday Kumar** for the encouragement and support that they have extended. We are also thankful to **Seema Lunawat** for technology enhanced reading, E-books support and the staff members of **TechKnowledge Publications** for their efforts to make this book as good as it is.

We have jointly made every possible efforts to eliminate all the errors in this book. However if you find any, please let us know, because that will help us to improve further.

- Author

SYLLABUS

SAVITRIBAI PHULE PUNE UNIVERSITY

B. E. Civil (2019 Pattern) w. e. f. July 2022

Quantity Surveying, Contracts and Tenders (401012)

Teaching Scheme		Credits	Examination Scheme	
Lectures	3 Hrs./Week	03	In-Semester	30 Marks
			End-Semester	70 Marks

PRE-REQUISITES :

Knowledge of building planning, roads and its structural components, construction materials

COURSE OBJECTIVES :

1. Impart knowledge to prepare approximate and detailed estimate of Civil Engineering works
2. To teach concepts of tendering process, contract document & Arbitration
3. To draft detailed specification and work out rate analysis according to material, labor requirements as per specified norms.
4. Impart knowledge of valuation, depreciation to carry out valuation of properties

COURSE OUTCOMES :

On successful completion of this course, the learner will be able to,

1. Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
2. Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents.
3. Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule.

4. Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
5. Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
6. Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend.

COURSE CONTENTS :

Unit 1 : Introduction and Approximate Estimates

(06 hours)

Definition of estimation, valuation, purpose, and data required for estimation, types, concept of item of work, different items of work of buildings, units and mode of measurement for different items of work, measurement form and abstract form (Bill of Quantities). Administrative approval and technical sanction, prime cost, provisional sum and provisional quantities, contingencies, rate analysis, lead statement, work charge establishment, centage charges, , contents of S. S. R. Approximate estimate. Methods of approximate estimate of Civil Engineering works: like building, roads, irrigation, water supply & sanitary works with numerical.

(Refer Chapter 1)

Unit 2 : Tenders, Contracts and Arbitration

(06 hours)

Tenders : Definition, detailed tendering process and procedure, conditions regarding earnest money, security deposit, retention money, pre and post qualification of contractors, 3 bid, 2 bid and single bid system, qualitative and quantitative evaluation of tenders, comparative statement, pre-bid conference, acceptance/ rejection of tenders, BOT & Global Tendering, E-tendering. PWD procedure for executing works piecework, rate list and daily labor, introduction to registration as a contractor in PWD.

Contracts : definition, objectives & essentials of a valid contract as per Indian Contract Act (1872), types of contracts, conditions of contract- defective work, subletting, etc. termination of contract, defect liability period, liquidated damages, interim payment or running account bills, advance payment, secured advance, final bill. Arbitration: Introduction to arbitrations as per Indian Arbitration & Conciliation Act (1996) - meaning and need of arbitration, qualities and powers of an arbitrator.

(Refer Chapter 2)

Unit 3 : Taking out quantities & Detailed estimate

(06 Hours)

Detailed estimates: factors to be considered while preparing detailed estimate, methods of detailed estimate-PWD and Centre line method, taking out quantities for load bearing and R.C.C framed structures as per IS 1200, bill of quantities. Bar Bending Schedule: introduction to bar bending schedule and its importance, preparing bar bending schedule for RCC members of building.

(Refer Chapter 3)

Unit 4 : Estimates of other construction works

(06 Hours)

Earthwork for road construction, estimate of road/highway works, estimate of steel roof truss, estimate of a culvert, water tank (elevated storage tank).

(Refer Chapter 4)

Unit 5 : Specifications and Rate Analysis

(06 Hours)

Necessity of specifications, purpose, types, drafting detailed specifications for major items of Civil Engineering works like earthwork, PCC, Masonry (stone & brick), RCC, Plastering, flooring, painting and road, Rate Analysis: purpose, importance, factors affecting rate of an item of work, overheads, task-work, procedure for rate analysis, rate analysis for major items of civil engineering works- like earthwork, PCC, masonry-stone & brick, RCC structural elements, plastering, flooring.

(Refer Chapter 5)

Unit 6 : Valuation

(06 Hours)

Introduction, valuation- purpose, types of property-real property and personal property, meaning of price, cost and value, factors affecting value, gross income, net income, outgoings, various forms of values, concept of free hold and lease hold property, depreciation, methods of calculating depreciation, obsolescence, sinking fund, years purchase, annuity. Methods of valuation of land and building: rental basis, direct comparison method, profit based method, development method, and rent fixation for building. Methods of Valuation of land: belting method of land valuation and other methods.

(Refer Chapter 6)

□□□

Chapter 1 : Introduction and Approximate**Estimates****1-1 to 1-23**

Syllabus : Definition of estimation, valuation, purpose, and data required for estimation, types, concept of item of work, different items of work of buildings, units and mode of measurement for different items of work, measurement form and abstract form (Bill of Quantities). Administrative approval and technical sanction, prime cost, provisional sum and provisional quantities, contingencies, rate analysis, lead statement, work charge establishment, centage charges, contents of S.S.R. Approximate estimate: Methods of approximate estimate of Civil Engineering works: like building, roads, irrigation, water supply & sanitary works with numerical.

1.1	Definition of Estimation	1-1
1.1.1	Quantity Surveying	1-1
1.1.2	Requirements of an Estimator	1-1
1.2	Valuation	1-1
1.3	Purpose of Estimation	1-2
1.3.1	Significance (Application) of the Course	1-2
1.4	Data Required for Estimation	1-2
1.5	Types of Estimates	1-3
1.6	Concept of Item of Works	1-5
1.7	Items of Work of Buildings	1-5
1.8	Units of Measurement	1-6
1.9	Mode of Measurement of Building Works	1-6
1.9.1	Rules for Deduction	1-7
1.10	Measurement Form	1-7
1.11	Abstract Form	1-7
1.12	Bill of Quantities (BOQ)	1-8
1.13	Administrative Approval	1-8
1.14	Technical Sanction	1-9
1.15	Prime Cost of Items	1-9
1.16	Provisional Cost of Items	1-10
1.17	Contingencies	1-10
1.18	Rate Analysis	1-10
1.19	Lead Statement	1-10
1.20	Work Charge Establishment	1-11

1.21	Introduction to schedule of Rates (S.S.R.)	1-11
1.23	Meaning of Approximate Estimate	1-21
1.24	Purpose of Approximate Estimate	1-21
1.25	Methods of Approximate Estimating of Building	1-21
1.26	Method of Preparation of Approximate Estimate for Road Projects	1-21
1.27	Methods to Find Out Approximate Cost or Estimation of Irrigation/ Water Supply, Sanitary Engineering, Electrical Works	1-21
1.27.1	Cost of Water Supply	1-21
1.27.2	Cost of Sanitation	1-21
1.27.3	Cost of Electrical Works	1-21
1.28	Approximate Estimate Problems	1-21

Unit-2**Chapter 2 : Tenders, Contracts and Arbitration****2-1 to 2-23**

Syllabus : Tenders : Definition, detailed tendering process and procedure, conditions regarding earnest money, security deposit, retention money, pre and post qualification of contractors, 3 bid, 2 bid and single bid system, qualitative and quantitative evaluation of tenders, comparative statement, pre-bid conference, acceptance and rejection of tenders, BOT & Global Tendering, E-tendering, PWD procedure for executing, works piecework rate and daily labor, introduction to registration as a contractor in PWD.

Contracts : definition, objectives & essentials of a contract as per Indian Contract Act (1872), types of contracts, conditions of contract- defective contract, subletting, etc. termination of contract, defect liability period, liquidated damages, interim payment or retention account bills, advance payment, secured advance final bill.

Arbitration: Introduction to arbitrations as per Indian Arbitration & Conciliation Act (1996) - meaning and scope of arbitration, qualities and powers of an arbitrator.

2.1	Definition of Tender	
2.2	Tendering Procedure	



2.2.1	Prequalification for Tenders.....	2-2	2.22	Budget Provision.....	2-20
2.3	Methods/Types of Inviting Tenders.....	2-2	2.23	General Idea about Contract.....	2-20
2.4	Tender Notice.....	2-2	2.24	Objectives & Essentials of a Valid Contract as Per Indian Contract Act (1872)/ Essentials of Valid Contract.....	2-20
2.5	Tender Documents.....	2-3	2.25	Types of Contracts.....	2-21
2.6	Bid Capacity.....	2-4	2.26	Conditions of Contract.....	2-23
2.7	Conditions of Contracts.....	2-4	2.26.1	Defective Work.....	2-23
2.7.1	Earnest Money.....	2-4	2.26.2	Subletting.....	2-23
2.7.2	Security Deposit.....	2-4	2.27	Termination of Contract.....	2-23
2.7.3	Retention Money.....	2-5	2.28	Defect Liability Period.....	2-24
2.7.4	Time as an Essence of Contract.....	2-5	2.29	Liquidated Damage.....	2-24
2.7.5	Voidable Contract.....	2-5	2.30	Interim Payment or Running Account Bills.....	2-24
2.8	Pre-qualification of Contractors.....	2-6	2.31	Advance Payment.....	2-25
2.8.1	Pre-qualification of Contractors.....	2-6	2.32	Secured Advance.....	2-25
2.8.2	Post-qualification of Contractors.....	2-7	2.33	Final Bill.....	2-25
2.9	Informal Tender.....	2-7	2.34	General and Specific Conditions.....	2-25
2.9.1	2-Bid System.....	2-7	2.35	FIDIC Document.....	2-26
2.9.2	3 Bid System.....	2-8	2.36	Important Conditions Regarding Addition.....	2-26
2.9.3	Detection of Unbalanced Bid.....	2-8	2.36.1	Alterations.....	2-26
2.10	Qualitative and Quantitative Evaluation of Tenders.....	2-9	2.36.2	Extra Items.....	2-27
2.11	Comparative Statement of Tenders.....	2-10	2.37	Dispute Resolution Board.....	2-27
2.12	Pre-bid Conference.....	2-10	2.38	Introduction to Arbitrations as per Indian Arbitration and Conciliation Act (1996) Meaning.....	2-28
2.13	Acceptance of Tender.....	2-11	2.38.1	Introduction to Arbitration.....	2-28
2.14	Rejection of Tender.....	2-12	2.38.2	Advantages and Disadvantages of Arbitration.....	2-28
2.15	Build Operate Transfer (B.O.T.) and its Various Forms.....	2-12	2.38.3	Need for Arbitration.....	2-28
2.16	Global Tender.....	2-14	2.39	Types of Arbitration.....	2-29
2.17	E - Tendering.....	2-14	2.40	Power of an Arbitrator.....	2-29
2.18	Unbalanced Tender.....	2-15	2.41	Qualifications of the Arbitrator.....	2-30
2.19	PWD Procedure of Work Execution.....	2-15	2.42	Qualities of an Arbitrator.....	2-30
2.19.1	Definitions.....	2-15	2.42.1	Role of Arbitrator in Civil Engineering Works.....	2-30
2.19.2	Requirement of Works Prior to its Execution.....	2-15	2.42.2	Appointment of Arbitrator.....	2-31
2.19.3	Classification of Works.....	2-16	2.43	Professional Liability.....	2-31
2.20	Different Methods of Execution of Minor Works in PWD / Piecework, Rate list, Daily Labour.....	2-16			
2.20.1	Muster Roll.....	2-18			
2.21	Introduction to Registration as Contractor in the P.W.D.....	2-18			

Unit-3**Chapter 3 : Taking Out Quantities and Detailed Estimate****3-1 to 3-54**

Syllabus : Detailed estimates : factors to be considered while preparing detailed estimate, methods of detailed estimate-PWD and Centre line method, taking out quantities for load bearing and R.C.C framed structures as per IS 1200, bill of quantities, Bar Bending Schedule: introduction to bar bending schedule and its importance, preparing bar bending schedule for RCC members of building.

3.1	Introduction.....	3-1
3.2	Factors to be Considered while Preparing Detailed Estimate.....	3-1
3.3	Detailed Estimate.....	3-1
3.3.1	Different Methods of Taking Out Quantities.....	3-2
3.4	Concept of Estimation of Load Bearing Structure Public Works Department (P.W.D.) Method (Long wall / Short Wall Method).....	3-3
3.5	Concept of Estimation of Load Bearing Structure (Centre Line Method).....	3-4
3.6	Detailed Estimate of R.C.C framed structures using IS 1200.....	3-25
3.6.1	Framed Structure.....	3-25
3.6.2	RCC Framed Structure.....	3-27
3.7	Bar Bending Schedule.....	3-39
3.7.1	Calculation of Quantity of Steels.....	3-39

Unit-4**Chapter 4 : Estimates of other Construction Works****4-1 to 4-39**

Syllabus : Earthwork for road construction, estimate of road/highway works, estimate of steel roof truss, estimate of a culvert, water tank (elevated storage tank).

4.1	Estimate of Earthwork.....	4-1
4.1.1	Introduction.....	4-1
4.1.2	Methods of Calculating Earthwork.....	4-2

4.1.3	Calculation of Quantities of Earthwork.....	4-1
4.2	Solved Examples.....	4-1
4.3	Estimate of a Pipe Culvert with Splayed using Walls.....	4-1
4.3.1	Pipe Culvert.....	4-1
4.4	Estimate of Septic Tank.....	4-1
4.5	Estimate of Septic Tank for 50 Users.....	4-1
4.6	Estimate of an R.C.C. Column.....	4-1
4.7	Estimate of Retaining Wall.....	4-1
4.7.1	Abstract Estimate.....	4-1
4.8	Estimate of Steel Roof Truss.....	4-1

Unit-5**Chapter 5 : Specifications and Rate Analysis 5-1 to 5-54**

Syllabus : Necessity of specifications, purpose of drafting detailed specifications for major items of Engineering works like earthwork, PCC, Masonry (stone brick), RCC, Plastering, flooring, painting and road works. Analysis: purpose, importance, factors affecting rate of item of work, overheads, task-work, procedure for analysis, rate analysis for major items of civil engineering works- like earthwork, PCC, masonry-stone & brick, structural elements, plastering, flooring.

5.1	Definition of Specification.....	5-1
5.1.1	Purpose of Specification.....	5-1
5.2	Types of Specification.....	5-1
5.3	Requirements of Good Specification.....	5-1
5.3.1	Step by Step Procedure/ Principles of Drafting a Specification.....	5-1
5.4	Drafting Detailed Specification for Common Items of Building Work.....	5-1
5.4.1	Excavation for Foundation / Payment for Major Items Like Excavation.....	5-1
5.4.2	Lime Concrete.....	5-1
5.4.3	Plain Cement Concrete (PCC).....	5-1

5.4.4	Burnt Brick Masonry, First Class in Cement Mortar.....	5-5	5.7.1	Factors Affecting Task Work.....	5-18
5.4.5	Random Rubble Masonry in Cement Mortar.....	5-6	5.8	Computation of Quantities of Materials Required for Various Items of Work.....	5-18
5.4.6	Coursed Rubble Masonry in Cement Mortar.....	5-7	5.8.1	Plain Cement Concrete (PCC).....	5-18
5.4.7	Mild Steel Bar Reinforcement for RCC Work.....	5-7	5.8.2	Reinforcement for RCC.....	5-19
5.4.8	Plastering in Cement Mortar.....	5-8	5.8.3	Main Brick Work in Superstructure.....	5-19
5.4.9	Pointing in Cement.....	5-8	5.8.4	Plastering.....	5-19
5.4.10	Damp Proof Course (DPC).....	5-9	5.8.5	Pointing.....	5-20
5.4.11	RCC Work for Slab.....	5-9	5.8.6	Floor Finishes.....	5-20
5.4.12	Ceramic Tile Flooring.....	5-10	5.8.7	Mangalore Tiled Roof.....	5-20
5.4.13	General Specification for Second Class Building.....	5-10	5.9	Water Charges.....	5-20
5.4.14	UCR Masonry for Foundation and Plinth.....	5-10	5.10	Transportation of Material and its Cost.....	5-21
5.4.14.1	Material Required.....	5-10	5.10.1	Transportation by Truck.....	5-21
5.4.15	Procedure of Execution.....	5-11	5.10.2	Transportation by Bullock Carts.....	5-21
5.4.16	Mode of Measurement.....	5-11	5.11	Rates Specified for Various Categories of Labours in Building Industry.....	5-21
5.4.17	Factors affecting Rate of An Item of Work.....	5-11	5.12	Analysis of Rates of Principal Items.....	5-21
5.4.18	Providing Corrugated GI sheet Roofing.....	5-12	5.13	Escalation of Prices.....	5-21
5.5	Definition of Rate Analysis.....	5-12	5.14	Rate Analysis for Major Items of Civil Engineering Works.....	5-22
5.5.1	Purpose of Rate Analysis.....	5-12	5.14.1	Numericals.....	5-22
5.6	Factors Affecting Rate Analysis.....	5-13	5.15	Direct Costs and Indirect Costs.....	5-36
5.6.1	Quantity of Materials and Cost.....	5-13			
5.6.2	Labour Cost.....	5-13			
5.6.3	Cost of Equipment, Tools and Plants.....	5-13			
5.6.4	Overhead Charges.....	5-13			
5.6.5	Establishment Charges.....	5-13			
5.6.6	Contractor's Profit.....	5-13			
5.6.7	Labour-Categories of Labour.....	5-14			
5.6.8	Labour Component.....	5-15			
5.6.9	Market Rates of Material and Labour.....	5-16			
5.6.10	Estimating Labour.....	5-16			
5.6.11	Sundries.....	5-17			
5.7	Task Work (Out Turn).....	5-18			

Unit-6

Chapter 6 : Valuation

6-1 to 6-16

Syllabus : Introduction, valuation- purpose, types of property-real property and personal property, meaning of price, cost and value, factors affecting value, gross income, net income, outgoings, various forms of values, concept of free hold and lease hold property, depreciation, methods of calculating depreciation, obsolescence, sinking fund, years purchase, annuity. Methods of valuation of land and building: rental basis, direct comparison method, profit based method, development method, and rent fixation for building. Methods of Valuation of land: belting method of land valuation and other methods.

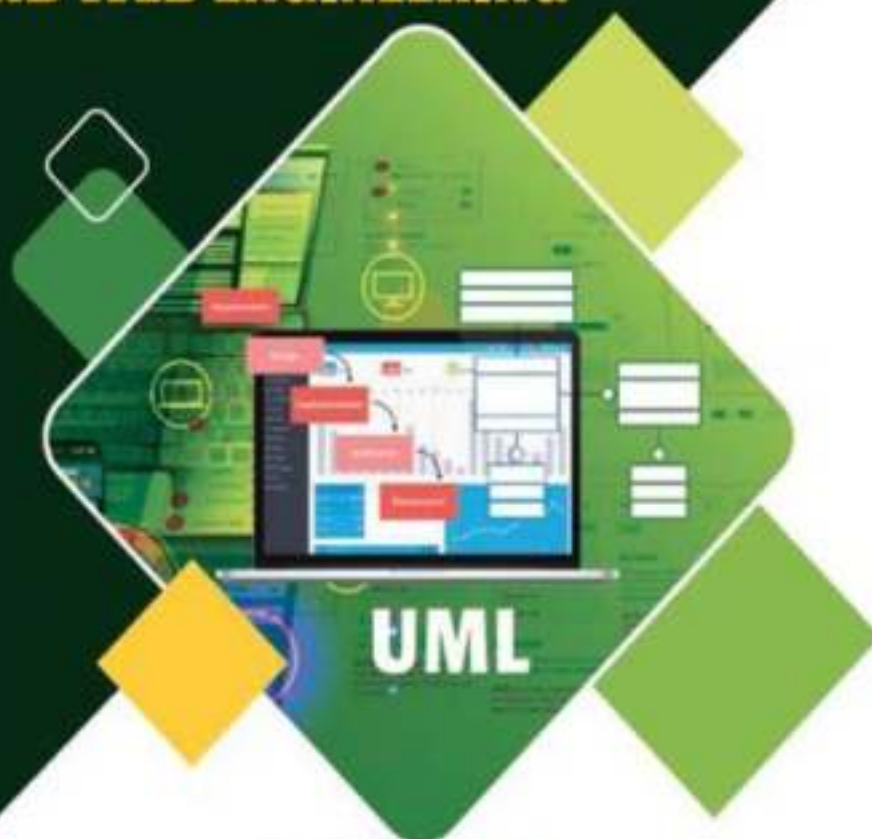
6.1	Valuation.....	6-1	6.9	Sinking Fund.....	6-9
6.1.1	Purpose of Valuation.....	6-1	6.10	Year's Purchase.....	6-9
6.1.2	Types of Property.....	6-2	6.11	Annuity.....	6-9
6.2	Meaning of Price, Cost and Value.....	6-2	6.12	Methods of Valuation of Land and Building : Rental Basis, Direct Comparison Method, Profit Based Method, Development Method, Rent Fixation.....	6-9
6.3	Factors Affecting Value of Property.....	6-3	6.12.1	Rental Basis.....	6-9
6.3.1	Gross Income.....	6-4	6.12.2	Direct Comparison Method.....	6-9
6.3.2	Net Income.....	6-4	6.12.3	Valuation based on Profit.....	6-9
6.3.3	Outgoings.....	6-4	6.12.4	Development Method of Valuation.....	6-9
6.4	Various Forms/Types of Value.....	6-4	6.12.5	Rent Fixation.....	6-9
6.5	Concept of Free Hold Property.....	6-6	6.13	Problems on Sinking Fund and Other Methods.....	6-9
6.6	Concept of Leasehold Property.....	6-6	6.14	Land and Building Method of Valuation.....	6-9
6.6.1	Difference between Estimation and Valuation.....	6-7	6.14.1	Belting Method of Valuation.....	6-9
6.7	Depreciation.....	6-7			
6.7.1	Methods of Calculation of Depreciation.....	6-7			
6.8	Obsolescence.....	6-8			

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Third Year (T.Y.) B.TECH Semester • VI
Course in INFORMATION TECHNOLOGY

OBJECT ORIENTED SOFTWARE AND WEB ENGINEERING



Dr. SACHIN P. GODSE

Mrs. RAMA B. GAIKWAD (LONDHE-PATIL) Mrs. PRANALI P. MAHADIK (MORE)

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Dr. SACHIN P. GODSE

M.E. CSE (IT), Ph.D.
Assistant Professor,
Computer Engg. Deptt.,
Sinhgad Academy of Engineering,
Kondhwa (Bk), PUNE.

Mrs. RAMA GAIKWAD (LONDHE-PATIL)

M.E. (Computer Networks)
Assistant Professor,
Computer Engg. Deptt.,
Anantao Pawar College of Engg. & Research,
Parvati, PUNE.

Mrs. PRANALI P. MAHADEK (MORE)

M. Tech (Computer),
Assistant Professor,
Computer Engg. Deptt.,
Anantao Pawar College of Engg. & Research,
Parvati, PUNE.

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Abhyudaya Pragati, 8352 Shivaji Nagar
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Nirali Prakashan

: Above Maratha Mandir, Shop No 3, Second Floor,
Rani Jhanshi Square, Sitabuldi, Nagpur 440012, Maharashtra
Tel : (0712) 254 7123, Email : nirali@nagpur@pragationline.com

DELHI

Nirali Prakashan

: 4593/15 Basement, Aganwal Lane, Ansari Road, Daryaganj
Near Times of India Building, New Delhi 110002 Mobile : 8505972553
Email : nirali@delhi@pragationline.com

BENGALURU

Nirali Prakashan

: Main Ground Floor, Jaya Apartments, No. 99, 6th Cross, 6th Main,
Mallematam, Bengaluru 560003, Karnataka
Mobile : 9449083054, Email : nirali@bangalore@pragationline.com

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PREFACE

It gives us great pleasure to present the book "Object Oriented Software and Web Engineering" for the students of Semester VI Third Year (T.Y.) B. Tech. Course Information Technology of Dr. Babasaheb Ambedkar Technological University (DBATU), Lonere, Dist. Raigad (Maharashtra). This book is strictly as per the new revised syllabus 2019-20 Pattern, effective from the Academic Year July 2019-20.

In New Revised Syllabus, there will Class Assessment (CA) 20 Marks, Mid Sem. Exam. (MSE) 20 Marks and End Sem. Exam. (ESE) 60 Marks. End Sem. Exam. will be based on all Six units and each unit will carry 20 Marks.

The Theory Course will have 3 Credits.

The basic objective of this book is to bridge the gap between the vast contents of the reference books, written by the renowned International Authors and the concise requirements of Undergraduate Students. This book has been written in a comprehensive manner using Simple and Lucid language, keeping in mind students' requirements. The main emphasis has been given on exploring the basic concepts rather than merely the Information. Solved Examples and Exercises have been provided throughout the book and at the end of the Unit. Also we have given **Model Question Papers** for practice at the end of book.

Our special thanks to our family members, students and all those who directly or indirectly supported us in this project.

We also take this opportunity to express our sincere thanks to Shri. Dineshbhai Furia, Shri. Jignesh Furia, Mrs. Nirali Verma, Shri. M. P. Munde and entire team of Nirali Prakashan, namely Mrs. Deepali Lachake (Co-ordinator), and her colleagues who really have taken keen interest and untiring efforts in publishing this text.

The advice and suggestions of our esteemed readers to improve the text are most welcome and will be highly appreciated.

Pune

Authors

SYLLABUS

Unit I

Object Basics, Object oriented philosophy, objects, classes, attributes, object behavior and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence, Object oriented systems development life cycle, Software development process, building high quality software, use-case driven approach, reusability.

Unit II

Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, and the unified approach. Unified modeling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modeling, packages, UML extensibility and UML Meta model.

Unit III

Object Oriented Analysis Process: Business object analysis, use-case driven object oriented analysis, business process modeling, use-case model, developing effective documentation, case study, Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes.

Unit IV

Identifying Object Relationships, Attributes and Methods: Association, super-subclass relationships, a-part of relationships, case study, class responsibility, Defining attributes for vianet bank objects, object responsibility, defining methods for vianet bank objects Design process and design axioms: Corollaries, design patterns.

Designing Classes: UML object constraint languages, designing classes, class visibility, refining attributes for the vianet bank objects, designing methods and protocols, designing methods for the vianet bank objects, packages and managing classes. Designing access layer, Designing view layer, macro level process.

Unit V

Introduction to Web Engineering and requirement engineering: Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage-related Characteristics, Development-related Characteristic, Web Application Architecture and Modeling Web Applications: Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures, Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling.

Unit VI

Web Application Design: Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes.

Testing Web Applications: Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation.

CONTENTS

Unit I: Introduction to Object Oriented Software Concept	1.1 – 1.6
1.1 Object Basics	1.1
1.2 Object Oriented Philosophy	1.1
1.3 Important Terms in Object Oriented Concepts	1.1
1.3.1 Basic Principles of Object Oriented Technology	1.2
1.4 Object Relationships and Associations	1.3
1.5 Object Identity	1.4
1.6 Object Oriented Systems Development Life Cycle	1.4
1.6.1 Introduction	1.4
1.7 The Software Development Process	1.4
1.8 Building High Quality software	1.5
1.9 Object Oriented System Development: A Usecase Driven Approach	1.5
1.9.1 Object-Oriented Analysis—Use-Case Driven	1.6
1.9.2 Object-Oriented Design	1.6
1.9.3 Prototyping	1.6
1.9.4 Implementation: Concept-Based Development	1.6
1.9.5 Reusability	1.6
• Exercise	1.6
Unit II: Object Oriented Methodologies	2.1 – 2.20
2.1 Rumbaugh Et Al's Object Modeling Technique	2.1
2.1.1 OMT Consists of Four Phases, Which can be Performed Iteratively	2.1
2.1.2 OMT Separates Modeling into Three Different Parts	2.1
2.2 The Booch Methodology	2.1
2.3 Jacobson Et Al. Methodologies	2.2
2.4 Patterns	2.2
2.4.1 Introduction	2.2
2.4.2 Describing Design Patterns	2.3
2.4.3 Catalog of Design Patterns	2.3
2.5 Frameworks	2.4
2.6 The Unified Approach	2.4
2.6.1 The Processes Are	2.4
2.6.2 The Methods and Technology Employed Include	2.4
2.6.3 Modeling Based on the Unified Modeling Language	2.5
2.7 Unified Modeling Language	2.5
2.7.1 UML History	2.5
2.7.2 Steps Towards UML	2.5
2.7.3 Different Versions of UML	2.5

2.7.4	UML is Basic Language for MDA	2.5
2.7.5	UML Structure	2.5
2.7.6	UML Building Blocks	2.5
2.7.7	Relationship in UML	2.7
2.7.8	Classification of Diagrams in UML	2.9
2.8	Use Case Diagram	2.10
2.8.1	Basic of Use Case Diagram	2.10
2.8.2	Example of UML Diagram	2.10
2.9	UML Class Diagram	2.10
2.10	UML Dynamic Modelling	2.11
2.10.1	Interaction Diagram	2.11
2.10.2	Sequence Diagram	2.11
2.10.3	Communication Diagram	2.12
2.10.4	Timing Diagram	2.13
2.10.5	Interaction Overview Diagram	2.13
2.11	State Machine / State Chart / State Transition Diagram	2.13
2.12	Package Diagram	2.14
2.12.1	Package	2.14
2.12.2	Inter Package Relationships	2.15
2.13	Introduction to Unified Process	2.15
2.13.1	Iteration Workflows	2.16
2.13.2	UP for Project	2.16
2.13.3	UP Axioms	2.16
2.13.4	Unified Process Structure	2.16
2.13.5	Phases in Unified Process	2.17
2.13.6	Unified Process and UML	2.18
2.13.7	Scope of UML	2.18
2.13.8	Extensibility Mechanisms	2.18
2.14	UML Meta Model	2.19
2.14.1	UML Definition Documents	2.19
2.14.2	Metamodel Structure	2.19
•	Exercise	2.20
Unit III : Object Oriented Analysis Process		3.1 – 3.8
3.1	Introduction	3.1
3.1.1	Business Object Analysis	3.1
3.1.2	Use Case Driven Object Oriented Analysis	3.1
3.1.3	Use Case Diagram	3.1
3.2	Classification Theory	3.4
3.2.1	Different Ways for Modeling Class Diagram	3.4
•	Exercise	3.8

Unit IV : Object Relationship	4.1 – 4.12
4.1 Identifying Object Relationships	4.1
4.2 Relationships	4.1
4.2.1 Super-Subclass Relationships	4.2
4.3 Case Study	4.3
4.3.1 Types of Object Relationships	4.3
4.4 Class-Responsibility-Collaborator Cards	4.5
4.5 Defining attributes for ViaNet	4.5
4.5.1 Design Axioms	4.6
4.5.2 Corollaries	4.6
4.6 Concept of Class Design	4.8
4.7 Designing Classes: Refining Attributes	4.8
4.8 Object Constraint Language	4.8
4.9 Class Visibility	4.9
4.9.1 Refining Attributes for the ViaNet Bank Objects	4.9
4.9.2 Refining Attributes for the Saving Account	4.10
4.9.3 Layer Architecture	4.11
4.10 UI Design Rules	4.11
4.10.1 Macro Level Design	4.12
• Exercise	4.12
Unit V : Web Engineering and Application	5.1 – 5.20
5.1 Introduction	5.1
5.2 Motivation Behind Web Engineering	5.1
5.3 Categories of Web Applications	5.1
5.4 Characteristics of Web Applications	5.2
5.4.1 Product-Related Characteristics	5.3
5.4.2 Usage-Related Characteristics	5.3
5.4.3 Development-Related Characteristics	5.4
5.5 Evolution of Web Engineering	5.4
5.5.1 Web Application Architecture	5.4
5.6 Components of a Generic Web Application Architecture	5.6
5.6.1 Application Architecture	5.6
5.6.2 Layered Architecture for Web Applications	5.7
5.6.3 The Basic Two Parts for Web Applications	5.7
5.6.4 The Three Layers Model	5.8
5.6.5 The View Layer	5.8
5.6.6 The Business Logic Layer	5.9
5.6.7 The Data Layer	5.10
5.6.8 Deepest in the Data Layer: NoSQL and NewSQL	5.10
5.6.9 Document Management System Architecture	5.10

5.6.10	Modeling Web Applications	5.11
5.6.11	Fundamentals	5.11
5.6.12	Modeling Specifics in Web Engineering	5.12
5.7	Modeling Specifics in Web Engineering	5.12
5.7.1	Levels	5.12
5.7.2	Aspects	5.13
5.7.3	Phases	5.13
5.7.4	Customization	5.13
5.7.5	Modeling Requirements	5.13
5.7.6	Content Modeling	5.14
5.7.7	Access Modeling Concepts	5.16
5.7.8	Relation to Content Modeling	5.17
5.7.9	Presentation Modeling	5.18
5.7.10	Relation to Hypertext Modeling	5.19
5.7.11	Customization Modeling	5.19
5.7.12	Relation to Content, Hypertext and Presentation Modeling	5.20
*	Exercise	5.20
Unit VI : Web Application Design		6.1 – 6.22
6.1	Introduction	6.1
6.2	Web Design from an Evolutionary Perspective	6.3
6.2.1	Background	6.3
6.3	Information Design	6.3
6.3.1	An Authoring Activity	6.3
6.4	Software Design	6.5
6.4.1	A Programming Activity	6.5
6.4.2	Programmable Web	6.5
6.4.3	Distributed Programming	6.5
6.4.4	Merging Information Design and Software Design	6.6
6.4.5	A Proposed Structural Approach	6.7
6.5	Merging Information Design and Software Design	6.7
6.6	Problems and Restrictions in Integrated Web Design	6.8
6.7	Presentation Design	6.8
6.8	Presentation of Nodes and Meshes	6.9
6.9	Testing Web Applications	6.10
6.10	Fundamentals	6.10
6.10.1	Terminology	6.10
6.10.2	Quality Characteristics	6.11
6.10.3	Test Objectives	6.11
6.10.4	Test Levels	6.12
6.10.5	Role of the Tester	6.12

6.11 Test Specifics in Web Engineering	6.12
6.11.1 Test Approaches	6.14
6.11.2 Conventional Approaches	6.14
6.11.3 Agile Approaches	6.14
6.12 Test Scheme	6.15
6.12.1 Three Test Dimensions	6.15
6.12.2 Applying the Scheme to Web Applications	6.16
6.12.3 Quality Characteristics	6.16
6.12.4 Test Objects	6.17
6.12.5 Phases	6.17
6.12.6 Examples of Using the Test Scheme	6.17
6.13 Test Methods and Techniques	6.17
6.13.1 Link Testing	6.18
6.13.2 Browser Testing	6.19
6.13.3 Usability Testing	6.19
6.13.4 Load, Stress, and Continuous Testing	6.19
6.13.5 Testing Security	6.20
6.13.6 Test-Driven Development	6.20
6.14 Test Automation	6.21
6.14.1 Benefits and Drawbacks of Automated Tests	6.21
6.14.2 Test Tools	6.22
• Exercise	6.22

