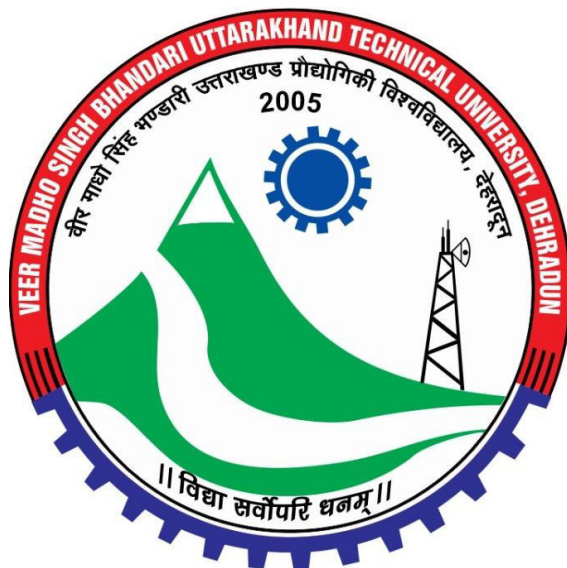


# VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)  
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- [www.uktech.ac.in](http://www.uktech.ac.in))



## SYLLABUS

Approved in 13<sup>th</sup> Meeting of Executive Council held  
on 27<sup>th</sup> March 2023 subsequent to the 14<sup>th</sup> Meeting  
of Academic Council held on 20<sup>th</sup> March 2023

(For admission in 2022-23 and onwards)



**VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL  
UNIVERSITY, DEHRADUN**

**MASTER OF TECHNOLOGY  
in  
CIVIL ENGINEERING**

**SYLLABS  
of  
THIRD SEMESTER (Open Elective)**



**VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL  
UNIVERSITY, DEHRADUN**

Proposed Scheme of Examination of M. Tech. 2 Year Programme for Specialization:

**Civil Engineering**

Semester I										
Sr.No.	Course Type	Course Type/Cod e	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1			Advanced Mathematics	3	1	0	4	50	100	150
2	Core-I	CET-301	Advanced Structural Analysis	3	1	0	4	50	100	150
3	Core-II	CET-302	Advanced Solid Mechanics	3	1	0	4	50	100	150
4	Professional Elective-1	CET-303	Analytical and Numerical Methods for Structural Engineering	3	0	0	3	50	100	150
		CET-304	Structural Health Monitoring							
		CET-305	Analysis of laminated composite Plates							
5	Professional Elective-2	CET-306	Theory of Thin plates and Shells	3	0	0	3	50	100	150
		CET-307	Theory and application of Cement Composites							
		CET-308	Theory of Structural Stability							
6		Core	CEP-301	Structural Design Lab	0	0	3	1	25	25
7	Core	CEP-302	Advance concrete Lab	0	0	3	1	25	25	50
8	Mandatory course	MLC	Research Methodology and IPR	2	0	2	2	50	50	100
9	Audit-1	Audit-1	Audit	2	0	0	0	50	0	50
			<b>Total</b>	<b>19</b>	<b>3</b>	<b>8</b>	<b>22</b>	<b>400</b>	<b>600</b>	<b>1000</b>
10	*Open Elective-1 (Optional)	*Open Elective-1 (Optional)		3	0	0	3	50	100	150
Semester II										
Sr.No.	Course Type	Course Type/Cod e	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	Core-III	CET-309	FEM in Structural Engineering	3	0	0	3	50	100	150
2	Core-IV	CET-310	Structural Dynamics	3	0	0	3	50	100	150
3	Professional Elective-3	CET-311	Advanced Steel Design	3	0	0	3	50	100	150
		CET-312	Design of High Rise Structures							
		CET-313	Design of Masonry Structures							
4	Professional Elective-4	CET-314	Design of Advanced Concrete Structures	3	0	0	3	50	100	150
		CET-315	Advanced Design of Foundations							
		CET-316	Design of Industrial Structure							
5		Open Elective-1	CET-317	Risk management in Construction	3	0	0	3	50	100
	CET-318		Environmental Impact Assessment							
	CET-319		Industrial Safety							
6	Core	CEP-303	Model Testing Lab	0	0	3	1	25	25	50
7	Core	CEP-304	Numerical Analysis Lab	0	0	3	1	25	25	50



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<b>8</b>	Audit-2	Audit-2		2	0	0	0	100	0	
			<b>Total</b>	<b>17</b>	<b>0</b>	<b>6</b>	<b>17</b>	<b>400</b>	<b>550</b>	950
<b>9</b>	*OpenEle ctive-2 (Optional)	*OpenElec tive-2 (Optional)		3	0	0	3	50	100	150
<b>SemesterIII</b>										
Sr.No.	Course Type	CourseT ype/Code	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
<b>1</b>	Open Elective- 2	CET-320	BusinessAnalytics	3	0	0	3	50	100	150
		CET-321	OperationsResearch							
		CET-322	CostManagementofEngineeringProjects							
<b>2</b>	Seminar	CEP 305	Project Seminar	0	0	4	2	100		100
<b>3</b>	Project	CEP 306	Project	0	0	10	5	100	150	250
<b>4</b>	Dissertation	CEP 307	Dissertation	0	0	12	6	300		300
			<b>Total</b>	<b>3</b>	<b>0</b>	<b>22</b>	<b>16</b>	<b>550</b>	<b>250</b>	<b>800</b>
<b>SemesterIV</b>										
Sr.No.		CourseT ype/Code	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
<b>1</b>	Dissertation	CEP 308	Dissertation	0	0	28	14	250	450	700
			<b>Total</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>14</b>	<b>250</b>	<b>450</b>	<b>700</b>



## Syllabus

### Business Analytics (CET-320 )

L:T:P:: 3:0:0

Credits-3

#### Course Objectives:

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques. Manage business process using analytical and management tools

**Course Outcomes:** At the end of the course, students will be able to

1. Demonstrate knowledge of data analytics.
2. Demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.
4. Demonstrate the ability to translate data into clear, actionable insights.
5. Capable of solving business analytic problems

#### Syllabus:

#### UNIT – I (08 Hours)

**Business analytics:** Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview

#### UNIT – II (08 Hours)

**Trendiness and Regression Analysis:** Modelling Relationships and Trends in Data, simple Linear Regression, Important Resources, Business Analytics Personnel, Data and models for



Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

**UNIT – III (10 Hours)**

**Organization Structures** of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization

**UNIT – IV (08 Hours)**

**Forecasting Techniques:** Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model

**UNIT – V (06 Hours)**

**Decision Analysis:** Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, the Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism

**Text Books:**

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

**Reference Books:**

1. Business Analytics by James Evans, persons Education.



## Syllabus

### Operation Research (CET-321 )

L:T:P:: 3:0:0

Credits-3

**Course Objective:** The course provides an overview of operation research.

**Course Outcomes:** At the end of the course, students will be

- 1: Able to understand the basics of OR and LPP.
- 2: Able to understand and solve the nonlinear programming problems and decision theory.
- 3: Able to understand and analyse game theory problems.
- 4: Able to understand and analyse dynamic and goal programming.
- 5: Able to understand and analyse PERT and CPM techniques

### Syllabus:

#### UNIT – I (10 Hours)

**Introduction:** Linear programming, Definition, scope of Operations Research (OR) approach and limitations of OR Models, Characteristics and phases of OR Mathematical formulation of L.P. Problems. Graphical solution methods. Linear Programming Problems: The simplex method - slack, surplus and artificial variables. Concept of duality, Big-M method, Two-phase method, degeneracy, and procedure for resolving degenerate cases.

#### UNIT – II (08 Hours)

**Nonlinear programming:** Kuhn- Tucker conditions- quadratic programming- Wolfe's algorithm. Decision Theory: Introduction, Decision under certainty, Decision under risk, Decision under uncertainty, Laplace criterion, Maxi Min criterion, Mini Max criterion, savage Mini Max regret criterion, hurwicz criterion, Decision tree

#### UNIT – III (08 Hours)

**Game Theory:** Formulation of games, two person-Zero sum game, games with and without saddle point, Graphical solution ( $2 \times n$ ,  $m \times 2$  game), dominance property, mixed strategy ( $3 \times 3$  or higher games). Introduction to optimization techniques, sequencing and scheduling, sensitivity analysis.

#### UNIT – IV (06Hours)

**Dynamic Programming:** Deterministic and stochastic example. Goal Programming:



Formulations Goal Programming Solutions Complexity of Simplex Algorithm

**UNIT – V**

**(08Hours)**

**PERT-CPM Techniques:** Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic models, prediction of date of completion.

**Text Books:**

1. Hiller & Lieberman, Introduction to Operations Research
2. Hira D. S. &Gupt P. K., Operations Research, S. Chand & Co. 1995.
3. Taha H. A., Operation Research, 7th Ed., Prentice Hall of India, New Delhi, 2002.

**ReferenceBooks:**

1. Wagner H. M., Principles of Operation Research with Applications to Managerial Decisions, 2nd Ed., PHI, 2010.
2. Vohra N.D, Quantitative Techniques in Management, Tata McGraw Hill, 1995.
3. Sharma J. K., Operation Research Theory and Applications, 2nd Ed., Macmillan, 2003.





## Syllabus

### Cost Management of Engineering Projects (CET-322 )

L:T:P:: 3:0:0

Credits-3

**Course Objective:** Students will be able to understand the tools of costing and managerial aspect to implement an engineering project

**Course Outcomes:** At the end of the course, students will be able to

- 1: understand the aspect of costing aspects in decision making and inventory.
- 2: Perceived knowledge of project execution.
- 3: understand the cost behavior and profit planning marginal costing.
- 4: understand the aspect of MRP, ERP and TQM.
- 5: Analyze the quantitative techniques for cost management.

### Syllabus:

#### UNIT – I (08 Hours)

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

#### UNIT – II (06 Hours)

**Project:** meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as a conglomeration of technical and non-technical activities

#### UNIT – III (10 Hours)

**Detailed Engineering activities.** Pre project execution main clearances and documents. Project team: Role of each member. Importance of project site: Data required with significance. Project contracts. Types and contents. Project execution. Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

#### UNIT – IV (08 Hours)

**Cost Behavior and Profit Planning** Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning



**UNIT – V**

**(08 Hours)**

**Total Quality Management** and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

**Text Books:**

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S. Kaplan and Anthony A. Alkinson, Management & Cost Accounting

**Reference Books:**

1. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
2. N. D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.