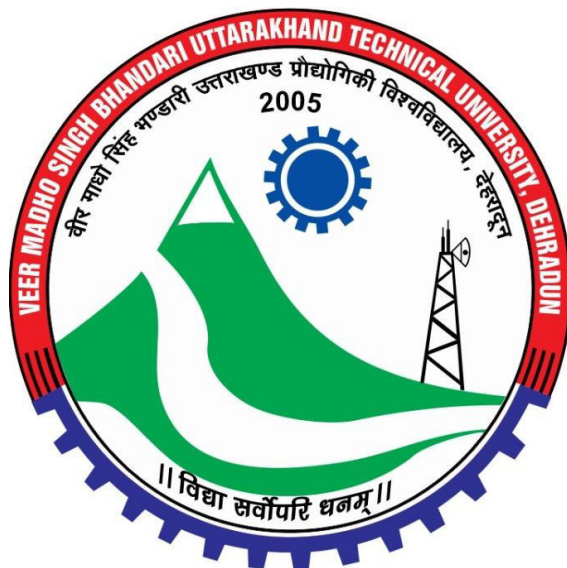


VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(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)



SYLLABUS

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

(For admission in 2022-23 and onwards)



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

**MASTER OF TECHNOLOGY
in
INFRASTRUCTURAL 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:

Infrastructure Engineering

Semester I										
Sr.No.	Course Type	Course Type/Code	Course Name	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-501	Infrastructural Planning	3	1	0	4	50	100	150
3	Core-II	CET-502	Project management in Construction and BIM	3	1	0	4	50	100	150
4	Professional Elective-1	CET-503	Optimization Methods	3	0	0	3	50	100	150
		CET-504	Numerical Methods							
		CET-505	Computational Methods in Civil Engineering							
5	Professional Elective-2	CET-506	Urban Flooding and Disaster Management	3	0	0	3	50	100	150
		CET-507	Modernization of Water Distribution System							
		CET-508	Water Resources System: Planning and Management							
6	Core	CEP-501	Infrastructure Engineering Lab I	0	0	3	1	25	25	50
7	Core	CEP-502	Programming Application for Engineers	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
			Total	19	3	8	22	400	600	1000
10	*Open Elective-1 (Optional)	*Open Elective-1 (Optional)		3	0	0	3	50	100	150
Semester II										
Sr.No.	Course Type	Course Type/Code	Course Name	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	Core-III	CET-509	Financing Infrastructure Projects	3	0	0	3	50	100	150
2	Core-IV	CET-510	Construction Methods and Equipment Management	3	0	0	3	50	100	150
3	Professional Elective-3	CET-511	Subsurface Investigation and Instrumentation	3	0	0	3	50	100	150



VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY, DEHRADUN

		CET-512	GroundImprovementTechniques								
		CET-513	EarthRetainingStructures								
4	Professional Elective-4	CET-514	AdvancedConcreteEngineering	3	0	0	3	50	100	150	
		CET-515	UrbanEnvironmentalManagement								
		CET-516	AdvancedStructuralDesign								
5	Open Elective-1	CET-317	RiskmanagementinConstruction	3	0	0	3	50	100	150	
		CET-318	EnviromentalImpactAssesment								
		CET-319	IndustrialSafety								
6	Core	CEP-503	SubsurfaceInvestigationand InsturmentationLab	0	0	3	1	25	25	50	
7	Core	CEP-504	SurveyingforInfrastructureProjects	0	0	3	1	25	25	50	
8	Audit-2	Audit-2		2	0	0	0	100	0		
			Total	17	0	6	17	400	550	950	
9	Open Elective-2(Optional)	*Open Elective-2(Optional)		3	0	0	3	50	100	150	

SemesterIII

Sr.No.	Course Type	CourseT ype/Code	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	Open Elective-2	CET-320	BusinessAnalytics	3	0	0	3	50	100	150
		CET-321	OperationsResearch							

		CET-322	CostManagementofEngineeringProjects							
2	Seminar	Seminar		0	0	4	2	100		100
3	Project	Project		0	0	10	5	100	150	250
4	Dissertation	Dissertation	Dissertation	0	0	12	6	300		300
			Total	3	0	22	16	550	250	800

SemesterIV

Sr.No.	Course Type	CourseT ype/Code	CourseName	Teaching Scheme			Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	Dissertation	Dissertation	Dissertation	0	0	28	14	250	450	700
			Total	0	0	28	14	250	450	700



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, predicative 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 (3×3 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.