SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Master of Science Quality and Productivity Management Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	**P2S01NCQPM01**	Business Statistics	4-0-0	120	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Recall and describe fundamental statistical concepts including descriptive statistics, data types, measures of central tendency, dispersion, and data visualization techniques applicable in business contexts.

CLO2: Explain the principles of probability, probability distributions (Binomial, Poisson, Normal), and sampling theory to model uncertainty in business decision-making.

CLO3: Apply hypothesis testing, confidence intervals, ANOVA, and chi-square tests to analyze real-world business data and draw evidence-based conclusions.

CLO4: Analyze relationships between business variables using correlation, simple and multiple regression analysis, and interpret results for managerial decision-making.

CLO5: Evaluate statistical quality control charts (X-bar, R, p, c), acceptance sampling, and process capability indices to assess and improve business and manufacturing processes.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Foundations of Business Statistics and Data Analytics • Introduction to Statistics: Role of statistics in modern business and management; types of data (cross-sectional, time series, panel); scales of measurement (nominal, ordinal, interval, ratio). • Descriptive Statistics: Frequency distributions, histograms, ogive; measures of central tendency (mean, median, mode, weighted mean); measures of dispersion (range, mean deviation, variance, standard deviation, coefficient of variation); measures of shape (skewness, kurtosis). • Data Visualization: Bar charts, pie charts, box plots, scatter plots, heat maps; storytelling with data; introduction to data dashboards using spreadsheets/R/Python. • Index Numbers: Simple and composite price indices; Laspeyre's, Paasche's and Fisher's index; consumer price index and its business applications.	CL PBL ICT EL	1 2 4
II	Probability Theory and Probability Distributions • Probability Concepts: Sample space, events, axiomatic definition; addition and multiplication rules; conditional probability; Bayes' theorem and its business applications (risk assessment, diagnostic reasoning). • Random Variables: Discrete and continuous random variables; expected value, variance; probability mass function and probability density function.	CL PBL ICT EL	1 4

Master of Science Quality and Productivity Management Semester-I

	• Discrete Distributions: Binomial distribution (quality control, market share modelling); Poisson distribution (queuing, defect occurrence); Hypergeometric distribution (sampling inspection). • Continuous Distributions: Normal distribution and the empirical rule; standard normal table usage; Exponential distribution (service time, reliability); Uniform distribution; Log-normal distribution (financial returns).		
III	Sampling Theory, Estimation, and Hypothesis Testing • Sampling Theory: Population vs. sample; sampling methods (simple random, stratified, cluster, systematic); sampling distribution of mean and proportion; Central Limit Theorem; standard error. • Estimation: Point estimation; interval estimation; confidence intervals for mean (σ known/unknown), proportion, and difference of means; sample size determination. • Hypothesis Testing: Null and alternative hypotheses; Type I and Type II errors; p-value approach; z-test, t-test (one sample, two sample, paired); F-test for equality of variances. • Non-parametric Tests: Chi-square test for goodness of fit and independence (customer preference surveys, contingency tables); Mann-Whitney U test; Kruskal-Wallis test. • Analysis of Variance (ANOVA): One-way and two-way ANOVA; post-hoc tests (Tukey's, Bonferroni); applications in product and process comparison.	CL ICT EL	3 4
IV	Correlation, Regression, and Forecasting • Correlation Analysis: Pearson's product-moment correlation; Spearman's rank correlation; partial and multiple correlation; spurious correlation. • Simple Linear Regression: OLS estimation; interpretation of slope and intercept; coefficient of determination (R^2); residual analysis; prediction intervals. • Multiple Regression Analysis: Multiple linear regression model; adjusted R^2; multicollinearity; heteroscedasticity; dummy variables for qualitative predictors; stepwise and logistic regression introduction. • Time Series and Forecasting: Components of time series (trend, seasonal, cyclical, irregular); moving averages; exponential smoothing (simple, Holt, Holt-Winters); trend projection; seasonal decomposition; introduction to ARIMA for business forecasting.	CL CBL	3 4 5

Master of Science Quality and Productivity Management Semester-I

- **Learning Pedagogies/Methods**
  (a) Classroom Lecture (CL)
  (b) Case-Based Learning (CBL)
  (c) Micro-Projects (MP)
  (d) Problem-Based Learning (PBL)
  (e) ICT-Enabled Learning through Digital Resources/ Virtual Labs/Webinars (ICT EL)

- **Assessment Methodologies**

(A) Internal Assessment

a. Internal Formative assessment

i. **MCQ and Objective question Quiz:** Students select or give the correct answer from the list of options four /none for a given questions.

ii. **Assignment:** A practical task or setup questions given to measure a student's knowledge, skill and ability in subject or field.

iii. **Seminar:** A student-led academic activity designed to evaluate student's ability to research, understand, and present a specific topic.

iv. **Group Discussion:** An interactive method to asses a student's personality and inter- personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an observer.

b. Internal Summative Assessment

i. **Mid-term tests**
A test conducted roughly halfway through an academic term or semester.

ii. **Laboratory performance**
Students demonstrate their laboratory hands-on performance skills, knowledge and ability to apply concepts in subjects.

iii. **Viva-voce**
An oral examination conducted to evaluate a student's in-depth knowledge, understanding, and critical thinking regarding a subject or project.

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	1, 2	30	4	5	3	12
II	2, 3	30	4	5	4	13
III	2, 3, 4	30	4	5	4	13
IV	3, 4, 5	30	3	5	4	12
		120	**15**	**20**	**15**	**50**

Master of Science Quality and Productivity Management Semester-I

Assessment and Evaluation

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Seminars, Assignments, Quizzes, Group Discussion	25%
		SA: Mid Term Test	25%
2	End-Semester Examination	Written Exam	50%

(C) CLOs – PLOs Matrix

CLO	PLO														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO1	-	-	3	2	1	1	1	2	1	1	-	-	2	3	1
CLO2	1	-	-	2	1	-	-	1	1	-	1	-	2	3	-
CLO3	1	-	2	-	1	1	-	1	-	3	-	-	2	3	-
CLO4	-	-	1	2	1	1	-	2	1	-	1	-	2	3	-
CLO5	1	1	2	3	1	3	2	2	1	-	1	-	2	3	-

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Business Statistics: Decision Making with Data	Groebner, D.F., Shannon, P.W., Fry, P.C.	10th/2022	Pearson Education
2	Statistics for Business and Economics	Anderson, D.R., Sweeney, D.J., Williams, T.A.	14th/2020	Cengage Learning
3	Business Statistics	Levin, R.I. and Rubin, D.S.	8th/2017	Pearson Education India
4	Applied Statistics in Business and Economics	Doane, D.P. and Seward, L.E.	6th/2020	McGraw-Hill Education
5	Practical Statistics for Data Scientists	Bruce, P., Bruce, A. and Gedeck, P.	2nd/2020	O'Reilly Media
6	Statistical Quality Control	Montgomery, D.C.	8th/2020	John Wiley & Sons

Master of Science Quality and Productivity Management Semester-I

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	Statistics and Probability – Khan Academy (Free online course modules)	https://www.khanacademy.org/math/statistics-probability
2	NPTEL: Business Statistics and Data Analysis (IIT course)	https://nptel.ac.in/courses/110105090
3	MIT OpenCourseWare: Statistics for Applications	https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/
4	Coursera: Business Statistics and Analysis Specialization (Rice University)	https://www.coursera.org/specializations/business-statistics-analysis
5	R for Statistical Computing – CRAN	https://cran.r-project.org/
6	NIST/SEMATECH e-Handbook of Statistical Methods	https://www.itl.nist.gov/div898/handbook/

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NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Master of Science Quality and Productivity Management Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	**P2S01NCQPM02**	Operations Research	4-0-0	120	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Apply optimization techniques such as Linear Programming, Transportation, and Assignment models to solve real-world decision-making problems.

CLO2: Demonstrate the ability to formulate and solve mathematical models using methods like Simplex, Integer Programming techniques.

CLO3: Evaluate project scheduling problems and inventory control models to improve operational efficiency.

CLO4: Apply queueing theory models to analyze service systems and evaluate system performance measures such as waiting time and utilization.

CLO5: Demonstrate analytical and problem-solving skills by interpreting results of Operations Research models and applying them in practical scenarios.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Introduction to Operations Research & Linear Programming • Optimization Techniques: Overview of the optimization techniques, Applications and scope of Operations Research. • Linear Programming Problem (LPP): Introduction to Linear Programming Problems (LPP), General Structure of LPP, Advantages and Limitations of LPP, Application of LPP, Mathematical formulation of the problem, Linear Programming: Simplex method, Integer Programming problem, Gomory's Cut method, Branch and Bound method.	CL PBL	1 2
II	Transportation and Assignment Problems • Transportation Problem (TP): Introduction, Area of application, mathematical model of TP maximization and minimization problems, Degeneracy, Balanced and unbalanced TP. North-West Corner Method (NWCM), Least Cost Method (LCM), Vogel's Approximation Method (VAM), Modified Distribution Method (MODI). • Assignment Problem (AP):Introduction, Area of application, mathematical model of AP-maximization and minimization problems, Hungarian Method, Multiple Optimal Solutions.	CBL CL PBL	1 2 5
III	**Network Analysis and Inventory Control Models** • Network Analysis: Definition and formulation, critical path method, Project Evaluation and Review Technique (PERT). • An Inventory control problem, reasons for carrying	CL MP CBL	3 5

	inventory, Deterministic inventory control models with and without shortages, Problem of EOQ with quantity discounts, Inventory problems with uncertain demand: single period problem without set-up cost and single period model with set-up cost (s, S)) policy.		
IV	Queueing Theory and Queueing Models • Basics of Queueing Theory: Introduction, structure of Queuing system, performance measures of a queuing system. • Queueing Models and Performance Measures: steady state solution of M/M/C/∞/FIFO and M/M/C/N/FIFO with associated distributions of queue length and waiting time. (C=1 as particular case).	PBL MP ICT EL	4 5

- **Learning Pedagogies/Methods**
  (f) Classroom Lecture (CL)
  (g) Case-Based Learning (CBL)
  (h) Micro-Projects (MP)
  (i) Problem-Based Learning (PBL)
  (j) ICT-Enabled Learning through Digital Resources/ Virtual Labs/Webinars (ICT EL)

- **Assessment Methodologies**

(D) Internal Assessment

a. Internal Formative assessment (25 Marks)

v. MCQ and Objective question Quiz: Students select or give the correct answer from the list of options four /none for a given questions.

vi. Assignment: A practical task or setup questions given to measure a student's knowledge, skill and ability in subject or field.

vii. Seminar: A student-led academic activity designed to evaluate student's ability to research, understand, and present a specific topic.

viii. Group Discussion: An interactive method to asses a student's personality and inter- personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an observer.

b. Internal Summative Assessment (25 Marks)

(a) Mid-term tests
A test conducted roughly halfway through an academic term or semester.
(b) Laboratory performance
Students demonstrate their laboratory hands-on performance skills, knowledge and ability to apply concepts in subjects.
(c) Viva-voce
An oral examination conducted to evaluate a student's in-depth knowledge, understanding, and critical thinking regarding a subject or project.

Master of Science Quality and Productivity Management Semester-I

(E) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	1, 2	30	4	5	3	12
II	1, 2, 5	30	4	5	4	13
III	3, 5	30	4	5	4	13
IV	4, 5	30	3	5	4	12
		120	**15**	**20**	**15**	**50**

- **Assessment and Evaluation**

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Seminars, Assignments, Quizzes, Group Discussion	25%
		SA: Mid Term Test	25%
2	End-Semester Examination	Written Exam	50%

(F) CLOs – PLOs Matrix

CLO	PLO												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
CLO1	**3**	**2**	**1**	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**
CLO2	**3**	**3**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**
CLO3	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**
CLO4	**3**	**2**	**1**	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**
CLO5	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**3**

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

Master of Science Quality and Productivity Management Semester-I

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Operations Research: An Introduction	Hamdy A. Taha	10th Edition/2017	Pearson
2	Operations Research	Kanti Swarup, P. K. Gupta, Man Mohan	20th Edition/2022	Sultan Chand & Sons
3	Operations Research: A Model-Based Approach	H. A. Eiselt, Carl-Louis Sandblom	3rd Edition/2022	Springer
4	Introduction to Operations Research	Hillier, Frederick S., and Gerald J. Lieberman	11th Edition/2018	McGraw-Hill
5	Operations Research: Problems and Solutions	Sharma, J. K.	3rd Edition/2009	Macmillan India Ltd.

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	Operations Research By Prof. Rajendra Singh | IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc25_ag15/preview

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Master of Science Quality and Productivity Management Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	**P2S01NCQPM03**	Statistical Quality Control Techniques	4-0-0	120	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Recall and explain the fundamental concepts of statistical quality control including process control, process capability, control limits, rational subgroup principle, average run length, and the relationship between hypothesis testing and control charts.

CLO2: Apply process capability indices (Cp, Cpk) using X-bar, R, and S charts to assess and determine process capability, analyse non-normal distributions, one-sided specifications, and defective parts per million.

CLO3: Evaluate potential and actual capability, construct confidence intervals, conduct gage and measurement system capability studies, set specification limits on discrete components (linear and non-linear combinations), and estimate natural tolerance limits.

CLO4: Analyse and implement advanced control charts including CUSUM, EWMA charts for monitoring process mean and variability, compare these with Shewhart charts, and apply acceptance sampling plans including chain sampling, continuous sampling, and skip-lot plans.

CLO5: Design and analyse experiments using fundamentals of experimental design (one-factor, two-factor, blocking, and interaction, 2^k factorial designs, and 2^{k-p} fractional factorial designs in the context of Statistical Process Control.

CLO6: Implement Taguchi's quality engineering principles including elements of robust design, signal-to-noise ratio analysis, and parameter design for process improvement.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Basic Concepts of Quality Control • Process control and process capability. Relation between theory of testing hypotheses and control charts. Choice of control limits, rational subgroup principle, allocating sampling effort, average run length. • Purpose of capability indices. Determining the process capability using $\bar{X}$–R, $\bar{X}$–S charts. The role of normality in determining defective parts per million. One-sided specification, non-normal distributions.	CL PBL ICT EL	1 2
II	Process Capability Analysis • Potential capability, actual capability, definitive analysis. Testing of potential capability. Confidence interval of potential capability and actual capability. Gage and measurement system capability study. • Setting specification limits on discrete components (linear and non-linear combination). Estimation of natural tolerance limit	CL PBL ICT EL	2 3

Master of Science Quality and Productivity Management Semester-I

	of a process.		
III	Advanced Control Charts and Acceptance Sampling • CUSUM charts, EWMA chart – use of these charts for prediction. CUSUM, EWMA for controlling process variability. Comparison of these charts with Shewhart charts. Acceptance control charts. • Acceptance sampling plan, chain sampling, continuous sampling plans, skip-lot sampling plans. Fundamentals of experimental design: one factor, two factor, blocking. Concept of interaction.	CL PBL ICT EL	4 5
IV	Process Design and Improvement with Designed Experiments: • Use of design of 2^k factorial design with $k \geq 1$. 2^{k-p} fractional factorial design in SPC. Taguchi's contribution to Quality Engineering. • Elements and principle of quality engineering. Steps in robust design; signal to noise ratio.	CL CBL MP	5 6

- **Learning Pedagogies/Methods**
  a) Classroom Lecture (CL)
  b) Case-Based Learning (CBL)
  c) Micro-Projects (MP)
  d) Problem-Based Learning (PBL)
  e) ICT-Enabled Learning through Digital Resources / Virtual Labs / Webinars (ICT EL)
- **Assessment Methodologies**

A. **Internal Assessment**

a. Internal Formative Assessment

I. **MCQ and Objective Question Quiz:**
Students select or give the correct answer from the list of options for a given question.

II. **Assignment:** A practical task or setup questions given to measure a student's knowledge, skill and ability in subject or field.

III. **Seminar:** A student-led academic activity designed to evaluate student's ability to research, understand, and present a specific topic.

IV. **Group Discussion:** An interactive method to assess a student's personality and inter-personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an observer.

b. Internal Summative Assessment

Master of Science Quality and Productivity Management Semester-I

I. **Mid-term tests:** A test conducted roughly halfway through an academic term or semester.

II. **Laboratory performance:** Students demonstrate their laboratory hands-on performance skills, knowledge and ability to apply concepts in subjects.

III. **Viva-voce:** An oral examination conducted to evaluate a student's in-depth knowledge, understanding, and critical thinking regarding a subject or project.

B. **Weightage of Learning Efforts for External Assessment**

Unit	Aligned CLOs	Total Learning Hours	Approximate Weightage (Marks) to Learning Levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application / Analyse & above (A)	
I	1, 2	30	4	5	3	12
II	2, 3	30	4	5	4	13
III	4, 5	30	4	5	4	13
IV	5, 6	30	3	5	4	12
		120	**15**	**20**	**15**	**50**

- **Assessment and Evaluation**

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Seminars, Assignments, Quizzes, Group Discussion	25%
		SA: Mid Term Test	25%
2	End-Semester Examination	Written Exam	50%

C. **CLOs – PLOs Matrix**

CLO	PLO														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CLO1	3	1	3	3	2	1	1	1	2	1	-	1	3	3	1
CLO2	3	2	3	3	3	1	-	2	3	2	-	1	3	3	2
CLO3	3	2	3	3	3	1	-	2	3	2	-	1	3	3	2
CLO4	3	2	2	3	3	1	2	2	3	2	-	1	3	3	2

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CLO5	2	3	3	2	3	1	-	3	3	2	-	2	3	3	2
CLO6	3	3	2	2	3	1	-	3	2	2	1	2	3	3	3

CLO – PLO Correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials / Books**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Introduction to Statistical Quality Control	Montgomery, D. C.	Wiley, 1985	John Wiley & Sons
2	Design and Analysis of Experiments	Montgomery, D. C.	Wiley, 1985	John Wiley & Sons
3	Statistical Methods for Quality Improvement	Rayon, T. P.	1989	John Wiley and Sons
4	Process Quality Control	Ott, E. R.	1975	McGraw Hill
5	Sampling Inspection and Quality Control	Wetherill, G. B.	1977	Halsted Press
6	Statistical Process Control, Theory and Practice	Wetherill, G. B. and Brown, D. W.	1991	Chapman and Hall
7	Quality Engineering through Robust Design	Phadke, M. S.	1989	Prentice Hall

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink

Master of Science Quality and Productivity Management Semester-I

1	NPTEL: Statistical Quality Control - Video Lectures	https://nptel.ac.in/courses/110105052
2	ASQ: American Society for Quality - Learning Resources	https://asq.org/quality-resources

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	**P2S01NCQPM04**	Data Base management and SQL Analytics.	0-4-0	120	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Demonstrate the ability to create and manage database structures, perform basic SQL operations, and implement data integrity constraints within a database environment.

CLO2: Analyze and execute complex SQL queries using joins, subqueries, aggregate functions, and grouping techniques for effective data retrieval and analysis.

CLO3: Apply database administration tasks including user creation, privilege management, and transaction control to ensure secure and efficient database operations.

CLO4: Develop and execute PL/SQL programs using block structures and control statements to perform procedural data manipulation and automation tasks.

CLO5: Evaluate database operations by integrating SQL and PL/SQL techniques to handle real-world data management scenarios effectively.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	• Database Creation and Connection • Table Creation using DDL Commands • Data Manipulation using DML Commands • Access Control using DCL Commands • Table Design with Constraints	ICT EL	1
II	• Data Retrieval using SELECT Queries • Aggregate Functions with GROUP BY and HAVING • Use of SQL Operators	ICT EL	1 2 5
III	• Correlated Subqueries • Modifying Constraints using ALTER • User Creation and Privilege Management	ICT EL	2 3 5
IV	• Basic PL/SQL Programming using Block Structure • PL/SQL Conditional Statements • PL/SQL Looping Statements	ICT EL	4 5

	• Exception Handling in PL/SQL		

- **Learning Pedagogies/Methods**

(k) Classroom Lecture (CL)
(l) Case-Based Learning (CBL)
(m) Micro-Projects (MP)
(n) Problem-Based Learning (PBL)
(o) ICT-Enabled Learning through Digital Resources/ Virtual Labs/Webinars (ICT EL)

- **Assessment Methodologies**

(G) Internal Assessment

a. Internal Formative assessment

ix. Group Discussion: An interactive method to asses a student's personality and inter- personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an observer.

b. Internal Summative Assessment

iv. Mid-term tests
A test conducted roughly halfway through an academic term or semester.

v. Laboratory performance
Students demonstrate their laboratory hands-on performance skills, knowledge and ability to apply concepts in subjects.

(H) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
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I	1	30	4	5	3	12
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III	2,3,5	30	4	5	4	13
IV	4,5	30	3	5	4	12
		120	**15**	**20**	**15**	**50**

- **Assessment and Evaluation**

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Seminars, Assignments, Quizzes, Group Discussion	25%
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(I) CLOs – PLOs Matrix

Master of Science Quality and Productivity Management Semester-I

CLO	PLO												
	1	2	3	4	5	6	7	8	9	10	11	12	13
CLO1	2	-	-	2	-	1	-	-	1	-	1	-	-
CLO2	3	-	-	3	-	2	-	-	2	1	-	-	-
CLO3	1	-	-	2	-	1	-	-	1	2	3	-	-
CLO4	2	-	-	2	-	1	-	-	1	-	-	-	-
CLO5	3	-	-	3	-	2	1	-	2	2	1	1	-

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Database Management System: Oracle SQL and PL/SQL	Pranab Kumar Das Gupta & P. Radha Krishna	2nd/ 2013	PHI Learning Pvt. Ltd. (Prentice Hall India)
2	SQL, PL/SQL: The Programming Language of Oracle	Ivan Bayross	2009	BPB Publications, New Delhi
3	Fundamentals of Database Systems	Ramez Elmasri & Shamkant B. Navathe	5th/2008	Dorling Kindersley (India) Pvt. Ltd., New Delhi

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	PL/SQL Complete Tutorial	https://www.plsql.co/procedure.html
2	SQLBolt	https://www.sqlbolt.com/
3	ThoughtSpot (SQL Tutorial)	https://www.thoughtspot.com/sql-tutorial

Master of Science Quality and Productivity Management Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	**P2S01NCQPM05**	Statistical Analysis using MS Excel	0-4-0	120	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Analyze and summarize quality datasets using Excel descriptive statistical tools and graphical methods for decision-making.

CLO2: Evaluate probabilistic models and sampling outcomes using Excel functions to estimate uncertainty and infer population characteristics.

CLO3: Apply inferential statistical techniques such as hypothesis testing and ANOVA in Excel to validate process assumptions.

CLO4: Develop predictive statistical models using correlation and regression techniques in Excel for process improvement.

CLO5: Integrate time-series analysis and comparative visualization methods to interpret trends and support managerial decisions.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Excel interface, central tendency, dispersion • Introduction to MS Excel Interface and Data Entry • Measures of Central Tendency Using Excel • Measures of Dispersion Using Excel	CL CBL	1
II	Probability distributions and sampling • Probability Distributions: Discrete (Binomial, Poisson, Hypergeometric) • Probability Distributions: Continuous (Normal, t, Chi-Square, F) • Sampling Methods and Confidence Interval Estimation	CL CBL	2
III	Hypothesis testing and ANOVA • Hypothesis Testing: z-Test and t-Test • Chi-Square Test and F-Test • Analysis of Variance (ANOVA): One-Way and Two-Way	CL CBL	3
IV	Business Analytics Techniques and Visualization	CL	4

	• Correlation Analysis • Simple Linear Regression • Multiple Linear Regression and Residual Diagnostics • Time Series Analysis Using Excel • Comparative Data Analysis Using Excel Charts • Creation of Dashboard for Statistical Reporting	CBL MP	5

- **Learning Pedagogies/Methods**
  (p) Classroom Lecture (CL)
  (q) Case-Based Learning (CBL)
  (r) Micro-Projects (MP)
- **Assessment Methodologies**

(J) Internal Assessment

a. Internal Formative assessment

x. Group Discussion: An interactive method to asses a student's personality and inter- personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an observer.

b. Internal Summative Assessment

(d) Mid-term tests
A test conducted roughly halfway through an academic term or semester.
(e) Laboratory performance
Students demonstrate their laboratory hands-on performance skills, knowledge and ability to apply concepts in subjects.

(K) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	1	30	4	5	3	12
II	2	30	4	5	4	12
III	3,4	30	4	5	4	13
IV	4,5	30	3	5	4	13
		120	**15**	**20**	**15**	**50**

- **Assessment and Evaluation**

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Seminars, Assignments, Quizzes, Group Discussion	25%
		SA: Mid Term Test	25%
2	End-Semester Examination	Written Exam	50%

(L) CLOs – PLOs Matrix

Master of Science Quality and Productivity Management Semester-I

CLO	PLO														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO1	3	-	-	2	-	2	-	-	3	1	-	1	-	-	-
CLO2	3	-	-	2	-	2	-	-	2	1	-	1	-	-	-
CLO3	3	-	-	3	-	2	-	-	2	2	-	1	-	-	-
CLO4	3	-	-	3	-	3	-	-	3	2	-	2	-	-	-
CLO5	2	-	-	3	-	3	-	-	3	3	-	2	-	-	-

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Data Analysis Using Microsoft Excel	Michael R. Middleton	7th/ 2021	Cengage Learning

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	Microsoft Excel Support and Training	https://support.microsoft.com/excel
2	NPTEL Course Materials on Business Statistics	https://nptel.ac.in
3	Real Statistics Using Excel	https://www.real-statistics.com

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Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	**P2S01NCQPM06**	Communication Skills	0-2-0	60	02

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Demonstrate clear, concise, and courteous verbal and non-verbal communication skills in interpersonal, academic, and professional contexts through self-introductions, role plays, discussions, and presentations.

CLO2: Apply active listening techniques and identify communication barriers to achieve complete, coherent, and effective communication in individual and group interactions.

CLO3: Compose and evaluate emails, business letters, reports, and other professional documents that are correct, concise, complete, and coherent, following appropriate formats and communication etiquette.

CLO4: Communicate ideas and information in a clear, concrete, and coherent manner through group discussions, oral presentations, debates, and interview simulations while demonstrating teamwork and leadership skills.

CLO5: Analyze and adapt communication strategies in digital and cross-cultural environments to ensure correct, courteous, complete, and culturally sensitive communication while adhering to netiquette and ethical practices.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Icebreaker & Self-Introduction Skills • Students prepare a 2-minute self-introduction • Include education, strengths, hobbies, goals Active Listening Drill • One student speaks/read aloud from a book for 2 minutes • Listener take dictation and give feedback Communication Barriers Role Play • Groups perform scenarios showing barriers (noise, misunderstanding, language issues)	CBL ICT EL	1 2 3

	• Other group identifies barriers Non-Verbal Communication Awareness • Silent role-play (no speaking allowed) • Express emotions using only body language Email Writing Workshop • Write formal and informal emails (complaint, request, inquiry) • Peer review correction session Business Letter Writing Exercise • Draft a formal business letter (e.g., leave request, complaint letter)		
II	Report Writing Task • Write a short report on an event (seminar, workshop, survey) Group Discussion Simulation • Topics: "Social media impact", "Online education vs classroom learning", and others. • Evaluate participation, clarity, leadership Mock Interview Session (Online / Offline Mode) • Students act as interviewer and candidate • Questions on education, skills, goals Oral Presentation Practice (Story Telling Format, Auditorium) • 5-minute presentation with PPT • Topics: climate change, technology, education Netiquette & Digital Communication Activity • Identify mistakes in sample emails/chats • Rewrite corrected versions Cross-Cultural Communication Debate • Debate on cultural communication differences • Example: "Work culture differences across countries"	CBL ICT EL	1 3 4 5

- **Learning Pedagogies/Methods**
  (s) Classroom Lecture (CL)
  (t) Case-Based Learning (CBL)
  (u) Micro-Projects (MP)
  (v) Problem-Based Learning (PBL)
  (w) ICT-Enabled Learning through Digital Resources/ Virtual Labs/Webinars (ICT EL)
- **Assessment Methodologies**
  (M) Internal Assessment
  a. Internal Formative assessment
  xi. Active Listening: An interactive method to asses a student's ability to listen, grasp, take dictation accurately and give feedback of lower to higher level.
  xii. Group Discussion: An interactive method to asses a student's personality and inter- personal skills in team setting. It typically involves 5 to 15 participants discussing a topic for 15 to 30 minutes in presence of an

observer.

xiii. **Cross-Cultural Communication Debate:** An interactive method to assess a student's communication, argumentation, critical thinking, and cross-cultural awareness skills through structured debates on cultural and workplace communication issues. It typically involves team-based discussions in the presence of an evaluator and focuses on clarity, coherence, confidence, teamwork, and respectful exchange of ideas.

b. Internal Summative Assessment

vi. **Oral Performance:** An interactive method to assess a student's verbal communication, presentation, storytelling, and public speaking skills. It typically involves a 5-minute oral presentation with or without visual aids (PPT) on a given topic in an auditorium or classroom setting. The assessment evaluates clarity, confidence, organization of ideas, pronunciation, body language, audience engagement, and the ability to communicate information effectively.

vii. **Mock Interview Performance:** An interactive method to assess a student's professional communication, interpersonal skills, confidence, and interview preparedness. It typically involves a simulated interview in which students act as candidates and respond to questions related to their education, skills, achievements, career goals, and problem-solving abilities in the presence of an evaluator. The assessment focuses on content of responses, communication effectiveness, confidence, professional etiquette, and overall interview performance.

- **Assessment and Evaluation**

Sr.No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	FA: Active Listening, Group Discussion, Cross-Cultural Communication Debate, Group Discussion	25%
		SA: Oral Performance, Mock Interview Performance	25%

(N) CLOs – PLOs Matrix

CLO	PLO										
	1	2	3	4	5	6	7	8	9	10	11
CLO1	-	-	-	-	-	1	-	3	2	-	1
CLO2	-	-	-	-	-	1	1	2	2	-	1
CLO3	-	1	-	-	-	2	1	3	1	2	-
CLO4	-	1	-	-	-	1	-	3	3	1	1
CLO5	-	-	-	-	-	3	2	2	2	-	2

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

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- **Suggested Learning Materials Books:**

Sr.No.	Title	Author(s)	Edition/Year	Publisher
1	Indian Folk Tales	Prithvishwar Gayen	1999	A CBT Publication
2	Amar Chitra Katha Series: A Jataka Stories	Pratap Mulick	1976	Amar Chitra Katha Pvt Ltd
3	The Art of Statistics Learning from Data	David Spiegelhalter	2019	Penguin Random House UK

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
	NPTEL	**https://nptel.ac.in/courses/109104031**