(Master of Science in Quality & Productivity Management) (Master of Science) (M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM51	Title of the Course	TOTAL QUALITY MANAGEMENT
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	1. To give the students an overview of quality and TQM and explaining the salient contributions of Quality Gurus like Deming, Juran and Crosby. General barriers in implementing Total Quality Management. 2. The students Will understand the TQM concepts like customer Focus, Employee Focus and their involvement, continuous process improvement and Supplier Management 3. To explore industrial applications of Quality function deployment, Taguchi quality concepts and TPM.

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction: Word Scenario, National Issues, Quality Education, Efficiency verses Effectiveness, Drivers of Quality. Principles of Quality Management: Definitions and Dimensions of Quality, Internal and External Customers, Vision and Mission Statements. Objectives, Goals, Targets and Action Plans. Philosophies of Quality Gurus. Ten Principles of Quality Management. Total Quality Management Philosophy: Evolution of TQM, Defining TQM, Preparing TQM, Stages in TQM Implementation and TQM Models.	25
2.	Quality Planning: SWOT Analysis, Strategic Planning and Organizational Culture. Customer Orientation: Customer Focus, Customer Satisfaction Model, Customer Retention Model, Quality Function Deployment(QFD), Customer Satisfaction Measurement(CSM). Human Dimension of TQM: Top Management Commitment, Leadership for TQM, Change Management, Motivational Strategies, Quality Circle Philosophy. Team Development: Synergy, Team Building, Communication and Transactional Analysis.	25

3.	Tools and Techniques for Quality Management : Quality functions development (QFD) – Benefits, Voice of Customer, information organization, House of Quality (HOQ), Building A HOQ, QFD Process. Failure Mode Effect Analysis (Fmea) – Requirements of Reliability, Failure Rate, Fmea Stages, Design, Process and documentation. Seven Old (Statistical) Tools. Seven New Management Tools, 5S Tool-Importance and Implementation, Bench Marking. Just in Time (JIT)	25
4.	Cost of Quality: Quality and Cost, Characteristic of Quality Cost, Micro Analysis of Quality Cost, Optimal Cost Relationship with Quality TQM Road Map: Measurement of Quality, TQM Road Map, TQM implementation strategy, Situations leading failure TQM.	25
...		

Teaching-Learning Methodology	Interactive Class Lectures, Case studies and Group Seminar.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Implement the principles and concepts inherent in a Total Quality Management (TQM) approach to managing a manufacturing or service organization
2.	Understand the philosophies--including similarities and differences--of the gurus of TQM in order to better evaluate TQM implementation proposals offered by quality management organizations and consultants

3.	Successfully implement process improvement teams trained to use the various quality tools for identifying appropriate process improvements.
4.	Assess exactly where an organization stands on quality management with respect to the ISO 9000 quality management standard
5.	Successfully implement process improvement teams trained to use the various quality tools for identifying appropriate process improvements.
6.	A strategy for implementing Total quality Management in an organization.

Suggested References:

Sr. No.	References
1.	Suganthi, L. and Samuel, A. A. (2005). " Total Quality Management", Prentice Hall of India Private Limited, New Delhi.
2.	Ramasamy, S. (2005). Total Quality Management, Tata McGraw Hill
3.	Logothetis, N. (1992). Managing Total Quality; Prentice Hall of India.
4.	Oakland J. S. (1989). Total Quality Management; Butterworth-Heinemann
5.	Shridhara Bhat K (2002).Total Quality Management – Text and Cases, Himalaya Publishing House.

On-line resources to be used if available as reference material
On-line Resources

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MASTER OF SCIENCE IN QUALITY AND PRODUCTIVITY MANAGEMENT
M.Sc. QPM, Semester – III

Course Code	PS03CQPM52	Title of the Course	KNOWLEDGE DISCOVERY AND DATA MINING
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of this course is to provide introduction to the principles and design of data mining and statistical machine learning algorithms. The course is aimed at providing foundations for conceptual aspects of data mining and machine learning algorithms along with their applications to solve real-world problems.

Course Content		
Unit	Description	Weightage* (%)
1.	Review of classification methods from multivariate analysis, classification and decision trees. Clustering methods from both statistical and data mining viewpoints.	25
2.	Unsupervised learning from univariate and multivariate data, dimension reduction and feature selection	25
3.	Supervised learning from moderate to high dimensional input spaces, artificial neural networks and extensions of regression models, regression trees	25
4.	Introduction to databases, including simple relational databases, data warehouses and introduction to online analytical data processing. (Revision) Association rules and prediction, data attributes, applications to electronic commerce	25

Teaching-Learning Methodology	Interactive Class Lectures, ICT tools, Live Demonstrations & Algorithm Building.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling, and identifying new trends and behaviours.
2.	understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. and strengths and weaknesses of many popular machine learning approaches.
3.	understand Machine Learning algorithms and the paradigms of supervised and un-supervised learning and applications.
4.	Construct basic feed-forward artificial neural networks with backpropagation. This develops a good foundation for studying deep learning.

Suggested References:	
Sr. No.	References
1.	Berson, A. and Smith, S.J. (1997). *Data Warehousing, Data Mining, and OLAP*. McGraw Hill.
2.	Breiman, L., Friedman, J.H., Olshen, R.A. and Stone, C.J. (1984). *Classification and Regression Trees*. Wadsworth and Brooks/Cole.
3.	Han,J. and Kamber.M. (2000). *Data Mining; Concepts and Techniques*. Morgan Kaufmann.
4.	Mitchell, T.M. (1997). *Machine Learning*. McGraw Hill
5.	Ripley, B.D. (1996). *Pattern Recognition and Neural Networks*. Cambridge University Press.

On-line resources to be used if available as reference material
On-line Resources

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MASTER OF SCIENCE IN QUALITY AND PRODUCTIVITY MANAGEMENT
M.Sc. Applied Statistics, Semester – III

Course Code	PS03CQPM53	Title of the Course	OPERATIONS RESEARCH – II
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively. 2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry. 3. Skills in the use of Operations Research approaches and computer tools in solving real problems in industry. 4. Mathematical models for analysis of real problems in Operations Research.

Course Content		
Unit	Description	Weightage* (%)
1.	Transportation Problem (TP): Introduction, Area of application, mathematical model of TP- maximization and minimization problems, Terminologies used in LPP. Degeneracy, Balanced and unbalanced TP. North-West Corner Method (NWCM), Least Cost Method (LCM), Vogel's Approximation Method (VAM), Modified Distribution Method (MODI)	25
2.	Assignment Problem (AP): Introduction, Area of application, mathematical model of AP – maximization and minimization problems, Hungarian Method, Multiple Optimal Solutions.	25
3.	Network Analysis: Introduction, Minimal spanning tree problem, Maximal flow problem. PERT and CPM- Terminologies used, Similarity and Differences, steps in PERT and CPM.	25
4.	Inventory Control-Deterministic and Probabilistic models, Non-linear Programming Problem- Kuhn-Tucker Conditions, Introduction to Simulation Techniques and Sequencing Problems.	25

Teaching-Learning Methodology	Interactive Class Lectures, ICT tools used

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Formulate of mathematical programming models
2.	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
3.	Understand the applications of, basic methods for, and challenges in non-linear programming.
4.	Identify, mathematically express and solve transportation problems.
5.	Learn optimality conditions for single- and multiple-variable unconstrained and constrained non-linear optimization problems, and corresponding solution methodologies
6.	design and solve simple models of CPM, queuing, assignment problems to improve decision making.

Suggested References:	
Sr. No.	References
1.	Kambo, N.S.(1991) Mathematical Programming Techniques Affiliated East-West Press Pvt. Ltd.
2.	Taha, H.A. (1992) Operations Research 5th Ed., Macmillan.
3.	Kanti Swarup, Gupta P. K. and Man Mohan Singh (1977). Operations Research, Sultan Chand & Sons.

4.	Vohra, N. D. (2011). Quantitative Techniques in Management, 4th Ed., Mc Graw Hill.
5.	Kapoor, V. K. (1998). Problems & Solutions in Operations Research, 2nd Ed., Sultan Chand & Sons.
6.	Sharma, S. D. (2001). Operations Research, 13th Ed., Kedar Nath Ram Nath & Co.
7.	Sharma, J. K. (2009). Quantitative Techniques For Managerial Decisions, 1st Ed. , Macmillan

On-line resources to be used if available as reference material
On-line Resources

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(Master of Science in Quality & Productivity Management) (Master of Science) (M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM54	Title of the Course	DESIGN OF EXPERIMENTS
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To know basic concepts and analysis of design of experiment, Factorial Experiments, Confounding, Fraction factorial design, Response surface designs.

Course Content		
Unit	Description	Weightage* (%)
1.	A review of basic concepts of design of experiment. Factorial Experiments: Concepts of main effects, interaction, Analysis of full 2n and 32 factorial designs, Confounding: Total and partial confounding. Analysis of 2n and 3n confounded design.	25
2.	2(n-p) Fractional Factorial Designs: Basic Idea, Generating the Design, The Concept of Design Resolution, Plackett-Burman Designs for Screening, Enhancing Design Resolution via Foldover, Aliases of Interactions: Design Generators, Blocking, Replicating the Design, Adding Center Points, Analyzing the Results of a 2(n-p) Experiment.	25
3.	(n-p) Fractional Factorial Designs: Overview, Designing 3(n-p) Experiments, Box-Behnken Designs, Analyzing the 3(n-p) Design, ANOVA, Parameter Estimates.	25
4.	Central Composite and Non-Factorial Response Surface Designs: Overview, Design Considerations, Alpha for Rotatability and Orthogonality, Available Standard Designs, Analyzing Central Composite Designs, The Fitted Response Surface, Categorized Response Surfaces. Taguchi Methods: Robust Design Experiments: Overview, Quality and Loss Functions, Signal-to-Noise (S/N) Ratios, Orthogonal Arrays, Analyzing designs, Accumulation Analysis.	25

Teaching-Learning Methodology	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%

2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the basic concepts of design of experiment and factorial experiments.
2.	Use and analysis of total and partial confounding in factorial experiments.
3.	Design and analysis of fractional factorial designs.
4.	Categorize Response Surfaces and able to fit Response Surface model.

Suggested References:	
Sr. No.	References
1.	Kshirsagar A.M. (1983) Linear Models (Marcel Dekker)
2.	John P.W.M.(1971) Linear Models (John Wiley Ltd.)
3.	Jeff Wu C. F., Hamada M. (2000): Experiments: Planning, Analysis and parameter design optimization, John Wiley & Sons.
4.	Montgomery D.C. (2001): Design and Analysis of Experiments, 5th edition, Wiley New York
5.	Angela Dean and Daneil Voss (1999): Design and Analysis of Experiments, Wiley
6.	Phadke, M.S. (1989): Quality Engineering using Robust Design, Prentice-Hall.

On-line resources to be used if available as reference material
On-line Resources

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(Mater of Science in Quality and Productivity Management) (Master of Science) (M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM55	Title of the Course	PRACTICALS BASED ON PS03CQPM53
Total Credits of the Course	04	Hours per Week	06

Course Objectives:	1. 2. …

Course Content		
Unit	Description	Weightage* (%)
1.		
2.		
3.		
4.		
...		

Teaching-Learning Methodology	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	
2.	
3.	
…	

Suggested References:	
Sr. No.	References
1.	
2.	
…	

On-line resources to be used if available as reference material
On-line Resources

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(Mater of Science in Quality and Productivity Management) (Master of Science) (M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM56	Title of the Course	PRACTICALS BASED ON PS03CQPM52 AND PS03CQPM54
Total Credits of the Course	04	Hours per Week	06

Course Objectives:	1. 2. …

Course Content		
Unit	Description	Weightage* (%)
1.		
2.		
3.		
4.		
...		

Teaching-Learning Methodology	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	
2.	
3.	
…	

Suggested References:	
Sr. No.	References
1.	
2.	
…	

On-line resources to be used if available as reference material
On-line Resources

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(Mater of Science in Quality and Productivity Management) (Master of Science) (M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM57	Title of the Course	Comprehensive Viva Voce
Total Credits of the Course	01	Hours per Week	02

Course Objectives:	1. 2. …

Course Content		
Unit	Description	Weightage* (%)
1.		
2.		
3.		
4.		
...		

Teaching-Learning Methodology	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	
2.	
3.	
…	

Suggested References:	
Sr. No.	References
1.	
2.	
…	

On-line resources to be used if available as reference material
On-line Resources

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MASTER OF SCIENCE IN QUALITY AND PRODUCTIVITY MANAGEMENT
M.Sc. QPM, Semester – III

Course Code	PS03CQPM58	Title of the Course	PLANNING AND ANALYSIS OF EXPERIMENTS
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. To familiarize the students with the statistical technique viz. Design of Experiments, for planning, designing and analyzing the experiment so that valid information can be drawn effectively and with great efficiency. 2. To familiarize with various methods of designing experiments. 3. To enable applicability of experimental designs and efficient execution.

Course Content		
Unit	Description	Weightage* (%)
I	A review of basic concepts of design of experiment. Factorial Experiments: Concepts of main effects, interaction, Analysis of full 2^n and 3^2 factorial designs, Confounding: Total and partial confounding. Analysis of 2^n and 3^n confounded design.	25
II	$2^{(n-p)}$ Fractional Factorial Designs: Basic Idea, Generating the Design, The Concept of Design Resolution, Plackett-Burman Designs for Screening, Enhancing Design Resolution via Foldover, Aliases of Interactions: Design Generators, Blocking, Replicating the Design, Adding Center Points, Analyzing the Results of a $2^{(n-p)}$ Experiment.	25
III	$3^{(n-p)}$ Fractional Factorial Designs: Overview, Designing $3^{(n-p)}$ Experiments, Box-Behnken Designs, Analyzing the $3^{(n-p)}$ Design, ANOVA, Parameter Estimates.	25
IV	Central Composite and Non-Factorial Response Surface Designs: Overview, Design Considerations, Alpha for Rotatability and Orthogonality, Available Standard Designs, Analyzing Central Composite Designs, The Fitted Response Surface, Categorized Response Surfaces. Taguchi Methods: Robust Design Experiments: Overview, Quality and Loss Functions, Signal-to-Noise (S/N) Ratios, Orthogonal Arrays, Analyzing designs, Accumulation Analysis.	25

Teaching-Learning Methodology	Interactive Class Lectures, ICT tools, Live Demonstrations & Algorithm Building.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To know how to plan, design and conduct experiments efficiently and effectively using various designs.
2.	Make use of the basics of Design of Experiments such as randomization and blocking.
3.	Appreciate the advantages and disadvantages of a design for a particular experiment
4.	Construct optimal or good designs for a range of practical experiments
5.	Understand the potential practical problems in its implementation.
6.	To describe how the analysis of the data from the experiment should be carried out.

Suggested References:	
Sr. No.	References
1.	Genichi Taguchi, S. Chowdhury, Yuin Wu (2004) Taguchi's Quality Engineering Handbook, John Wiley & Sons, New Jersy.
2.	Forrest W. Breyfogle III (2003). 2nd Ed. Implementing SIX SIGMA Smarter Solutions Using Statistical Methods, John Wiley & Sons, New Jersy.
3.	Jeff Wu C. F., Hamada M. (2000): Experiments: Planning, Analysis and parameter design optimization, John Wiley & Sons.
4.	Montgomery D.C. (2001): Design and Analysis of Experiments, 5th edition, Wiley New York.
5.	Angela Dean and Daneil Voss (1999): Design and Analysis of Experiments, Wiley.

6.	Phadke, M.S. (1989): Quality Engineering using Robust Design, Prentice-Hall.

On-line resources to be used if available as reference material
On-line Resources

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(Master of Science in QPM) (Master of Science)
(M. Sc.) (QPM) Semester (III)

Course Code	PS03CQPM59	Title of the Course	Pattern Recognition
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	• Introduce fundamental concepts and techniques of statistical pattern recognition. • Equip students with essential algorithms and techniques for supervised and unsupervised learning. • Provide hands-on experience with practical applications of pattern recognition. • Develop critical thinking skills for evaluating and adapting algorithms to different scenarios.

Course Content		
Unit	Description	Weightage* (%)
1.	Overview of pattern recognition and its applications, Field related to pattern recognition: Artificial Intelligence, Machine Learning, Image Analysis, stages in pattern recognition, approaches to statistical pattern recognition: Bayes decision rule for minimum error, Bayes decision rule for minimum risk, Neyman-Pearson decision rule, linear discriminant functions, density estimation: parametric approach-Normal based models, maximum likelihood parameter estimation, Expectation Maximization (EM) algorithm Bayesian estimation.	25
2.	Nonparametric density estimation – Bayesian belief networks, KNN method, Kernel density estimation. Supervised learning algorithms: Linear regression, Classification algorithms: k-Nearest neighbors, decision trees, support vector machines, ensemble methods.	25
3.	Unsupervised Learning – clustering problem: partition methods – k-means clustering, k-medoid clustering; Hierarchical methods – Agglomerative algorithms: single linkage algorithm, complete linkage algorithm; evaluation of clustering. Feature selection criteria, Linear feature extraction: Principal Component Analysis (PCA), Singular Value Decomposition (SVD), Introduction to Artificial Neural Network (ANN).	25

4.	Pattern recognition for sequential data: Markov models, Hidden Markov Models (HMM), Maximum likelihood for the HMM, forward-backward algorithm, sum-product algorithm, Viterbi algorithm. Case studies: Exploring real world applications of pattern recognition in different domains such as, image processing, fraud detection and so on.	25

Teaching-Learning Methodology	• Engage students through traditional lectures, providing conceptual understanding of statistical pattern recognition algorithms and their applications. • Facilitate practical learning through hands on exercises, allowing students to implement algorithms using programming languages like Python.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Comprehensive understanding of statistical pattern recognition algorithms and their applications.
2.	Ability to choose appropriate algorithms based on the nature of the data and task.
3.	Exhibit critical thinking skills in evaluating and comparing different approaches.
4.	Prepare students for industry roles by integrating case studies and platforms commonly used in pattern recognition applications.

Suggested References:

Sr. No.	References
1.	Christopher M. Bishop (2006): Pattern Recognition and Machine Learning, Springer.
2.	Andrew R. Webb (2002): Statistical Pattern Recognition, 2E, John Wiley and Sons.
3.	Duda et al. (2001): Pattern Classification, 2E, John Wiley
4.	K. Fukunaga (1990): Introduction to statistical pattern recognition, 2e, AP
5.	B. D. Ripley (1996): Pattern Recognition and Neural Networks, Cambridge university Press.
6.	M. Friedman and A. Kandel (2020): Introduction to Pattern Recognition, World Scientific.

On-line resources to be used if available as reference material

https://www.javatpoint.com/pattern-recognition-in-machine-learning

https://onlinecourses.nptel.ac.in/noc23_ee119/preview

https://www.geeksforgeeks.org/pattern-recognition-basics-and-design-principles/