SYLLABI AND SCHEME OF EXAMINATIONS FOR MINOR COURSES FOR UNDER GRADUATE PROGRAMS (SINGLE MAJOR / MULTIDISCIPLINARY/ BACHELOR OF SCIENCE (MATHEMATICS) 4-YEAR PROGRAMS)

(Based on Curriculum and Credit Framework for UG Programs under NEP)

WITH EFFECT FROM THE SESSION 2024-25

MAHARSHI DAYANAND UNIVERSITY ROHTAK (HARYANA)

SYLLABI AND SCHEME OF EXAMINATIONS FOR MINOR COURSES FOR

UNDER GRADUATE SINGLE MAJOR/MULTIDISCIPLINARY PROGRAMS/ SINGLE MAJOR PROGRAM AFTER 2nd SEMESTER OF MULTIDISCIPLINARY PROGRAM

Minor Courses (MIC)/ Minor (Vocational) Course MIC(VOC)	TYPE OF PROGRAM				Credits Distribution			Total Credits	Workload			Total Workload	Marks				
	SINGLE MAJOR PROGRAM	MULTIDISCIPLINARY PROGRAM / SINGLE MAJOR PROGRAM AFTER 2nd SEMESTER OF MULTIDISCIPLINARY PROGRAM	Nomenclature of Course	Course Code	L	T	P		L	T	P		Theory		Practical		Total Marks
	SEMESTER	SEMESTER											Internal	External	Internal	External	
MIC 1 @ 4 credits	1	1	Basic Mathematics	**24MAT401MI01**	3	1	0	4	3	1N	0	3+1N	30	70	0	0	100
MIC 2 @ 4 credits	2	3	Business Mathematics	**25MAT402MI01**	3	1	0	4	3	1N	0	3+1N	30	70	0	0	100
MIC 3 @ 4 credits	3	6	Operations Research	**26MAT403MI01**	2	0	2	4	2	0	4N	2+4N	15	35	15	35	100
MIC 4 (VOC) @ 4 credits	4	4	Mathematical Computing using Python	**25MAT404MV01**	2	0	2	4	2	0	4N	2+4N	15	35	15	35	100
MIC 5 (VOC) @ 4 credits	5	5	Mathematical Computing using Matlab	**26MAT405MV01**	2	0	2	4	2	0	4N	2+4N	15	35	15	35	100
MIC 6 (VOC) @ 4 credits	6	6	Data Structure Using C	**26MAT406MV01**	2	0	2	4	2	0	4N	2+4N	15	35	15	35	100
MIC 7 (VOC) @ 4 credits	7	7	Programming in C and Data	**24MAT201MV01**	2	0	2	4	2	0	4N	2+4N	15	35	15	35	100

			Structure														
MIC 8 (VOC) @ 4 credits	8	8	Applied Numerical Analysis	**24MAT202MV01**	3	1	0	4	3	1N	0	3+1N	30	70	-	-	100

N : Total Number of Groups in the Class

L: Lecture; T: Tutorial; P: Practical

Note:

1. The Syllabi and Scheme of Examinations (SOE) for Minor (Vocational) Courses for UG Semester 7 and Semester 8 will be same as applicable for Vocational Course in Post Graduate semester 1 and semester 2 respectively.
2. Course coding of Minor courses for Single Major Programs will be applicable for Multidisciplinary Programs/ Multidisciplinary Programs after 2nd semester irrespective of their offering in any semester.
3. The student who select any Minor Course (MIC) of any discipline in first semester should study the Minor courses (MIC) in the same discipline in the subsequent semesters. However, while exercising the option for choosing Minor Vocational Course MIC (VOC), the student may opt the discipline either related to the discipline of Minor Course or the discipline of Major Course or any other discipline as per his/her choice.

Syllabi for Minor Courses in Mathematics

Semester: I

Name of Program		**Program Code**	
Name of the Course	**BASIC MATHEMATICS**	**Course Code**	**24MAT401MI01**
Hours per Week	04 Hours	**Credits**	04 Credits
Maximum Marks	100{External (term-end exam) – 70} (Internal – 30)	**Time of Examinations**	03 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

CLO1 Determine the type of matrices and compute the elementary operations on the matrices**.**
CLO2 Use methods of integration to solve many real life problems.
CLO3 Obtain maxima and minima of several functions.
CLO4 Solve several system of linear equations using matrices.

Section – I

Calculus: (Problems and theorems involving trigonometrically ratios are not to be done). Differentiation: Partial derivatives up to second order; Homogeneity of functions and Euler's theorem; total differentials, Differentiation of implicit function with the help of total differentials. Maxima and Minima; Cases of one variable involving second or higher order derivatives; Cases of two variables involving not more than one constraint.

Section – II

Integration: Integration as anti-derivative process; Standard forms; Methods of integration by substitution, by parts, and by use of partial fractions; Definite integration; Finding areas in simple cases; Consumers and producers surplus; Nature of Commodities learning Curve; Leontiff Input-Output Model.

Section – III

Matrices: Definition of matrix; Types of matrices; Algebra of matrices.

Section – IV

Determinants: Properties of determinants; calculation of values of determinants up to third order; Adjoint of a matrix, through Adjoint and elementary row or column operations; Solution of system of linear equations having unique solution and involving not more than three variables.

References:

1. Allen R.G.D: Basic Mathematics; Mcmillan, New Delhi, 1971.
2. Volra. N. D. Quantitative Techniques in Management, Tata McGraw Hill, New Delhi, 1990.
3. Kapoor V.K. Business Mathematics: Sultan chand and sons, Delhi, 1985.

Semester: II

Name of Program		**Program Code**	
Name of the Course	**BUSINESS MATHEMATICS**	**Course Code**	**24MAT402MI01**
Hours per Week	04 Hours	**Credits**	04 Credits
Maximum Marks	100{External (term-end exam) – 70} (Internal – 30)	**Time of Examinations**	03 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

CLO1 Solve many LPP using graphs**.**

CLO2 Use methods of LPP to solve many problems related to transportation, maximization and minimization etc.

CLO3 Obtain compound interest wit different types of interest rates.

CLO4 Understand the problems related to annuities.

Section – I

Linear Programming-Formulation of LPP: Graphical method of solution; Problems relating to two variables including the case of mixed constraints; Cases having no solution, multiple solutions, unbounded solution and redundant constraints.

Section – II

Simplex Method—Solution of problems up to three variables, including cases of mixed constraints; Duality; Transportation Problem.

Section – III

Compound Interest: Certain different types of interest rates; Concept of present value and amount of a sum.

Section – IV

Annuities: Types of annuities; Present value and amount of an annuity, including the case of continuous compounding; Valuation of simple loans and debentures; Problems relation to sinking funds.

References:

1. Allen R.G.D: Basic Mathematics; Mcmillan, New Delhi, 1971.
2. Volra. N. D. Quantitative Techniques in Management, Tata McGraw Hill, New Delhi, 1990.
3. Kapoor V.K. Business Mathematics: Sultan chand and sons, Delhi, 1985.

Semester: III

Name of Program		**Program Code**	
Name of the Course	**OPERATIONS RESEARCH**	**Course Code**	**25MAT403MI01**
Hours per Week	06 Hours	**Credits**	04 Credits
Maximum Marks	**100 (50 Theory + 50 Practical)**	**Time of Examinations**	03 Hours

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.

Course Learning Outcomes (CLO):

CLO1 Know about operations research models, its methodology and classification.
CLO2 Formulate and solve LPP's using Graphical and Simplex methods.
CLO3 Understand the concept of duality in linear programming.
CLO4 Define, classify and handle different types of transportations problems.
CLO5 Distinguish between assignment problems, crew assignment problems, travelling salesman problems and the techniques to solve them.

Section – I

Linear programming problems (LPP): Introduction to linear programming problems (LPP), Mathematical formulation of the linear programming problems with illustrations. Graphical method used for solving linear programming problem. Feasible region of LPP, unbounded solution to the LPP in graphical method, Canonical and standard form of LPP.

Section – II

Simplex Method: Basic and non basic variables, Theory of Simplex method, optimality and unboundlessness, Simplex algorithm, Simplex method in tableau format. Introduction to artificial variables, Two –phase simplex method, Big-M method, Degeneracy problem in simplex method.

Section – III

Transportation Problem: Introduction to transportation problem, Initial basic feasible solution to transportation problem using North-West Corner, Least Cost Method and Vogel's approximation Method. Optimal solution to transportation problem using MODI method, Unbalanced transportation problem, Degeneracy in transportation problem.

Section – IV

Assignment Problem: Introduction to assignment problem, Mathematical formulation of assignment problem, Solution to assignment problem using Hungarian method.

Part-B (Practical)

Max. Marks : 50 {External (term-end exam) – 35}
(Internal – 15)

Time : 3 Hours

There will be a separate practical paper consisting of implementation of Linear Programming, studied in the theory paper **25MAT403MI01**(Part-A). There will be five questions in all, and the students must attempt any three questions. The question paper will set on the spot jointly by the internal and external examiners.
Distribution of Marks will be as follows:

Marks for Question Paper:	21
Marks for Practical Record Book:	06
Marks for Viva-Voce:	08
Total:	35

References:

1. KantiSwarup, P.K. Gupta and Man Mohan-Operations Research, S. Chand and Co. Pvt.Ltd, 2010.
2. Kalavathy- Operations Research, Vikas Publishing House Pvt. Ltd, 2012.