



Proposed Syllabus for UG (MINOR ELECTIVE)

SUBJECT: MATHEMATICS

Syllabus Developed/Proposed by				
S. No.	Name of Expert/BoS Member	Designation	Department	College/ University
1.	Prof. H.S. Shukla	Retd. Professor & Expert	Mathematics & Statistics	D.D.U. Gorakhpur University, Gorakhpur
2.	Prof. D.N. Dubey	Retd. Professor & Expert	Mathematics & Statistics	D.D.U. Gorakhpur University, Gorakhpur
3.	Prof. J.P. Vishwakarma	Retd. Professor & Expert	Mathematics & Statistics	D.D.U. Gorakhpur University, Gorakhpur
4.	Dr. Veena Singh	Associate Professor & Convener	Mathematics	M.L.K.(P.G.) College, Balrampur
5.	Shri Ram Asrey Gautam	Assistant Professor	Mathematics	M.L.K.(P.G.) College, Balrampur
6.	Shri Lavkush Pandey	Assistant Professor	Mathematics	M.L.K.(P.G.) College, Balrampur

**Semester wise Title of the Papers in UG (MINOR ELECTIVE COURSE)
MATHEMATICS**

Year	Semester	Course Code	Paper Title	Theory/ Practical	Credits
FIRST	SEM-I	B030101T(M)	ELEMENTARY MATHEMATICS, NUMBER THEORY, AND CALCULUS	THEORY	4
	AND SEM-II	B030201T(M)			

SECOND	SEM-III	B030301T(M)	MATRICES, LINEAR PROGRAMMING, MATHEMATICAL LOGIC AND ELEMENTARY STATISTICS	THEORY	4
	AND	AND			
	SEM-IV	B030401T(M)			

Subject Prerequisites:

To study this course, a student must have the subject Mathematics in 10th class.

Program Outcomes (POs)

PO1: It is to give foundation knowledge for the students to understand basics of mathematics including applied aspects for the same.

PO2: It is to develop enhanced quantitative skills in pursuing higher classes and research as well.

PO3: Students will be able to develop solution-oriented approach towards various issues related to their environment.

PO4: Students will become employable in various government and private sectors.

PO5: Scientific temper in general and mathematical temper in particular will be developed in students.

Program Specific Outcomes (PSOs)

First Year	Minor Elective Course I in Mathematics	Student should be able to possess recall basic idea about mathematics which can be displayed by them.
Second Year	Minor Elective Course II in Mathematics	Student should have adequate exposure to many aspects of mathematical sciences. Student is equipped with mathematical modelling ability, critical mathematical thinking, problem solving skills, etc. and apply his/her skill and knowledge in various field of studies including Science, Social Science, Engineering, Commerce and Management etc.

SEMESTER-I and SEMESTER- II
MINOR ELECTIVE COURSE-I IN MATHEMATICS

Programme: MINOR ELECTIVE COURSE-I IN MATHEMATICS		Year: FIRST	Semester: FIRST & SECOND
Subject: MATHEMATICS			
Course Code: B030101T(M) AND B030201T(M)		Course Title: ELEMENTARY MATHEMATICS, NUMBER THEORY AND CALCULUS	
<p>Course outcomes:</p> <p>CO1: The program outcome is to give foundation knowledge for the students to understand basics of mathematics including applied aspect for developing enhanced quantitative skills and pursuing higher mathematics and research as well.</p> <p>CO2: By the time students complete the course, they will have wide ranging application of the subject and have the knowledge of real valued functions along with series.</p> <p>CO3: The main objective of the course is to equip the student with necessary analytic and technical skills. By applying the principles of integral he/she learns to solve a variety of practical problems in science, Social Science, etc.</p> <p>CO4: The student is equipped with standard concepts and tools at an intermediate to advance level that will serve him/her well towards taking more advance level course in mathematics.</p>			
Credits: 4		Minor Elective	
Max. Marks: 25+75		Min. Passing Marks: As per UGC/ University CBCS norm.	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0			
Unit	Topics		No. of Lectures
<p>Part I</p> <p>ELEMENTARY MATHEMATICS</p>			
I	Definition of a set, operations on sets, Venn-diagrams, Number system, relations, equivalence relations, functions and graphs.		7
II	Inequalities, linear and Quadratic equations, Trigonometric, logarithmic and exponential functions, representation of numbers with change of base.		7
III	Limit, Continuity and differentiability of a function of single variable. Permutation and combination, Binomial expansion, properties of binomial coefficients.		10
IV	Arithmetic progression, geometric progression, harmonic progression, vectors, sum, difference, dot and cross product of two vectors.		6



Part II		
NUMBER THEORY AND CALCULUS		
V	Prime and composite numbers, relatively prime numbers, Fundamental theorem of Arithmetic (without proof), Divisibility in the set of integers, division algorithm (without proof), greatest common divisor, Euclid's algorithm for finding greatest common divisor (without proof), least common multiple.	7
VI	Mathematical induction, Congruences and their basic properties, Test of divisibility.	6
VII	Differential coefficients of x^n , $\sin x$, $\cos x$, e^x , $\log_e x$, constant, $\log_a x$, Differential coefficients of sum, product and quotient of two functions, Differential coefficient of a function of a function, Problems related to business, Economics, Life and Social Sciences.	7
VIII	Some standard integrals of functions, Integral of a sum, Methods of integration: Substitution, Integration by parts, Definite Integral and Fundamental Theorem of calculus (without proof), Introduction to differential equations, Order and degree of a differential equation, Equations of first order and first degree (separation of variables and linear), Problems related to business, Economics, Life and Social Sciences.	10

Suggested Readings (Part- I, Elementary Mathematics):

1. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, College Mathematics for Business, Economics, Life Sciences and Social Sciences (13th edition), Pearson.
2. Laurence D. Hoffmann, Gerald L. Bradley, Applied Calculus: for Business, Economics and the Social and Life Sciences (Expanded 10th edition), McGraw-Hill Higher Education.
3. H.S. Hall & S.R. Knight, Higher Algebra, MacMillan and Co., London
4. Course Books published in Hindi may be prescribed by the University.

Suggested Readings (Part-II, Number Theory and Calculus):

1. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, College Mathematics for Business, Economics, Life Sciences and Social Sciences (13th edition), Pearson.
2. Laurence D. Hoffmann, Gerald L. Bradley, Applied Calculus: for Business, Economics and the Social and Life Sciences (Expanded 10th edition), McGraw-Hill Higher Education.
3. T.M. Apostol, Calculus Vol. II, John Wiley Publication
4. Gorakh Prasad, A text book on Differential Calculus, Pothishala Private Ltd., Prayagraj.
5. Gorakh Prasad, A text book on Integral Calculus, Pothishala Private Ltd., Prayagraj.
6. Shanti Narayan & P.K. Mittal, Integral Calculus, S.Chand.
7. S. Balachandra Rao & C. K. Shantha, Differential Calculus, New Age Publication.
8. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
9. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
10. I. Niven, H. S. Zuckerman, and H. L. Montgomery, (2003) An Introduction to the Theory of Numbers (6th edition) John Wiley and sons, Inc., New York.
11. D. M. Burton, Elementary Number Theory (4th edition) (2002), McGraw-Hill.
12. B. Rai, D.P. Choudhary & H. J. Freedman, A Course in Differential Equations, Narosa.
13. Course Books published in Hindi may be prescribed by the University.

Suggestive Digital Platforms/ Web Links:

- National Programme on Technology Enhanced Learning (NPTEL)
- SWAYAM
- Uttar Pradesh Higher Education Digital Library (UPHEDL)
- National Digital Library of India (NDLI)

This course can be opted as a minor elective by the students of following subjects: Open to all

Suggested Continuous Evaluation Methods (Max. Marks: 25)

S.No.	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment	5

Course prerequisites:

To study this course, a student must have the subject Mathematics in 10th class.

Suggested equivalent online courses:

1. Swayam - https://www.swayam.gov.in/explorer?category=Math_and_Sciences
2. National Programme on Technology Enhanced Learning (NPTEL), <https://nptel.ac.in/course.html>
3. MIT Open Course Ware - Massachusetts Institute of Technology, <https://ocw.mit.edu/courses/mathematics/>
4. Coursera, <https://www.coursera.org/courses?query=mathematics>
5. edX, <https://www.edx.org/course/subject/math>

Further Suggestions:

Students and Faculty should be updated themselves by current knowledge of subjects and related course through digital resources, Journals and textbooks.

Any remarks/ suggestions:

The course content can be modified by BOS successively catering to local need of University and Students.



SEMESTER-III and IV
MINOR ELECTIVE COURSE-II IN MATHEMATICS

Programme: MINOR ELECTIVE COURSE-II IN MATHEMATICS		Year: SECOND	Semester: THIRD & FOURTH
Subject: MATHEMATICS			
Course Code: B030301T(M) AND B030401T(M)		Course Title: MATRICES, LINEAR PROGRAMMING MATHEMATICAL LOGIC AND ELEMENTARY STATISTICS	
<p>Course outcomes: CO1: The topics of the course are included in such a way that they focus on developing mathematical skills in matrices, linear programming from basic level to depth of knowledge. CO2: The student will be able to find the rank, eigen values of matrices and study the linear homogeneous and non-homogeneous equations. CO3: The students will be capable of learn and visualize the fundamental concepts of Statistics. CO4: On successful completion of the course, students will have gained knowledge of logical reasoning. They have the foundation for higher course of any subject.</p>			
Credits: 4		Minor Elective	
Max. Marks: 25+75		Min. Passing Marks: As per UGC/ University CBCS norm.	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0			
Unit	Topics		No. of Lectures
Part- I			
MATRICES AND LINEAR PROGRAMMING			
I	Matrix, types of matrices, Submatrices, determinant of a square matrix, Elementary operations on Matrices, Rank of a Matrix, Echelon form of a Matrix, Normal form of a Matrix.		7
II	Inverse of a Matrix by elementary operations, System of linear homogeneous and non-homogeneous equations, Theorems on consistency of a system of linear equations (without proof), Solution of system of linear equations.		7
III	Introduction to Linear programming problems, statement and formulation of general linear programming problems, standard and matrix forms of linear programming problem, slack and surplus variables, feasible solution, optimal solution, graphical solution.		9
IV	Convex set, Fundamental theorem of linear programming (without proof), Introduction to Simplex method for linear programming problem (Excluding Artificial Variable Techniques).		7



Part- II

MATHEMATICAL LOGIC AND ELEMENTARY STATISTICS

V	Proposition, logical connectives, truth tables, tautologies, tautological equivalence, contradiction, modus ponens and modus tollens, validity of proposition, proof by implication, proof by using truth table.	7
VI	Theory of Probability: Random experiment, sample space, event, definition of probability, Law of addition of probabilities, Multiplication law of probability and conditional probability, Probability of pairwise independent events.	7
VII	Frequency distribution, Measures of central tendency-mean, median, mode, Measures of dispersion: Range, quartile deviation, Mean deviation, Standard deviation.	9
VIII	Correlation, Coefficient of correlation, Karl Pearson's Correlation coefficient, Spearman's rank correlation coefficient, Regression, Regression coefficient.	7

Suggested Readings (PART-I Matrices and Linear Programming):

1. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, College Mathematics for Business, Economics, Life Sciences and Social Sciences (13th edition), Pearson.
2. Shanti Narayan & P.K Mittal, A text book of Matrices, S. Chand & Company Ltd.
3. Kanti Swarup, P. K. Gupta, Man Mohan Operations research, Sultan Chand & Sons.

Suggested Readings (Part-II Mathematical Logic and Elementary Statistics):

1. C. L. Liu, Elements of Discrete Mathematics (2nd Edition), McGraw-Hill.
2. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with applications to Computer Science, Tata McGraw-Hill
3. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw-Hill.
4. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen, College Mathematics for Business, Economics, Life Sciences and Social Sciences (13th edition), Pearson.
5. S. C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
6. एस० एन० सिंह, प्राकृतिक एवं सामाजिक विज्ञानों में सांख्यिकी (2019), कोशल पब्लिशिंग हाउस, फैजाबाद-224001 (उ० प्र०)

Suggestive Digital Platforms/ Web Links:

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This course can be opted as a minor elective by the students of following subjects: Open to all

Suggested Continuous Evaluation Methods (Max. Marks: 25)

S.No.	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment	5

Course prerequisites:

To study this course, a student must have opted the Minor Elective course-I, Mathematics in UG first year.

Further Suggestions:

Students and Faculty should be updated themselves by current knowledge of subjects and related course through digital resources and textbooks.

Any remarks/ suggestions:

The course content can be modified by BOS successively catering to local need of University and Students.