**Pandit Deendayal Upadhyaya Shekhawati University, Sikar**

# SYLLABUS

## SCHEME OF EXAMINATION AND COURSE OF STUDY UNDER NEP 2020

### For

### (SEMESTER SCHEME: I & II Semester)

### FACULTY OF SCIENCE

### UG0803 – Three/Four Year Bachelor of Science (Mathematics Group)

**Medium of Instruction: Hindi and English**

**EXAMINATION 2023-2024 AND ONWARDS**

| Name of University | Pandit Deendayal Upadhyaya Shekhawati University, Sikar |
|---|---|
| Name of Faculty | Science |
| Name of Programme | UG0803-Three/Four Year Bachelor of Science (Maths Group) |
| Name of Discipline | Mathematics |

| PROGRAMME PREREQUISITES |
|---|
| Mathematics course of XIIth std. of Central Board of Secondary Education or equivalent. |
| **PROGRAMME OUTCOMES (PO)** |
| The program would enable students to take on advanced courses in Mathematics with global needs and to serve as a formidable skill-force in research, academia, industry, government, and other sectors where Mathematics is reckoned as a strong devising and design tool with diverse interdisciplinary applications. |

# Scheme of Examination-

### I credit = 25 marks for examination/evaluation

The terminal examination (Theory & Practical) will contribute to the final grade. Each course in Semester Grade Point Average (SGPA) has two components- Practical Examination and Theory Examination.

1.  Practical Examination will consist of Viva-Voce, Record of Practical Work and examination(s) etc., as determined by the external and internal examiners.External examiners will be appointed by the University.
2.  Each Paper of Theory examination shall carry 100 marks out of 150Total marks of the course/subject. The Theory examination will be of 3 hours duration. Question paper consiststwo parts and total five questions, each of 20 marks as –

    ➤ Part-A of the question paper shall consist one question based on knowledge, understanding and applications of the topics/texts covered in the syllabus with 08 short answer type questions, two from each of the units.
    ➤ Part-B of the question paper shall consist four questions, one from each unit. Each Question will have four parts. Candidates are required to attempt all four units by taking any two parts from each question.
3.  75% Attendance is mandatory for appearing in examination.
4.  Credit points in a Course/Subject will be assigned only if, the student obtains at least a "C" grade in Practical examination and Theory examination of a Course/Subject.

# Contact Hours -

## 15 Weeks per Semester

| | |
|---|---|
| L - Lecture | (1 Credit = 1 Hour/Week) |
| T - Tutorial | (1 Credit = 1 Hour/Week) |
| S - Seminar | (1 Credit = 2 Hours/Week) |
| P - Practical/Practicum | (1 Credit = 2 Hours/Week) |
| F - Field Practice/Projects | (1 Credit = 2 Hours/Week) |
| SA - Studio Activities | (1 Credit = 2 Hours/Week) |
| I - Internship | (1 Credit = 2 Hours/Week) |
| C - Community Engagement and Service | (1 Credit = 2 Hours/Week) |

## Exit and Entrance Policy

1. Students who opt to exit after completion of the first year and have secured 48 credits will be awarded a **UG Certificate** if, in addition, they complete one internship of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

2. Students who opt to exit after completion of the second year and have secured 96 credits will be awarded the UG diploma if, in addition, they complete one internship of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

3. Students who wish to undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 150 credits and satisfying the minimum credit requirement.

4. A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with 200 credits and have satisfied the minimum credit requirements.

5. Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research streram in the fourth year. They should do a research project or dissertation under the guidance of a faculty member of the University/College. The research project/dissertation will be in the major discipline. The students who secure 200 credits, including 12 credits from a research project/dissertation, are awarded UG Degree (Honours with Research).

## Letter Grades and Grade Points

| Letter Grade | Grade Point | Marks Range % |
|---|---|---|

Registrar

| | | |
|---|---|---|
| 0 (outstanding) | 10 | 91 - 100 |
| A+ (Excellent) | 9 | 81 - 90 |
| A (Very good) | 8 | 71 - 80 |
| B+ (Good) | 7 | 61 – 70 |
| B (Above average) | 6 | 51 - 60 |
| C (Average) | 5 | 40 - 50 |
| P (Pass) | 4 | |
| F (Fail) | 0 | |
| Ab (Absent) | 0 | |

When students take audit courses, they may be given a pass (P) or fail (F) grade without any credits.

| Name of University | Pandit Deendayal Upadhyaya Shekhawati University, Sikar |
|---|---|
| Name of Faculty | Science |
| Name of Programme | UG0803-Three/Four Year Bachelor of Science (Maths Group) |
| Name of Discipline | Mathematics |

## Syllabus: UG0803-Three/four Year Bachelor of Science
## (Maths Group)
## I - Semester - Mathematics
## (2023-2024 & onward)

| Type | Paper code and Nomenclature | Duration of Examination | Maximum Marks | Minimum Passing Marks |
|---|---|---|---|---|
| Theory | UG0803-MAT-51T-101-Calculus &Optimization Techniques | 3Hrs | 100 Marks | 40 Marks |
| Practical | UG0803-MAT-51P-101 Practical/Lab work-Optimization Techniques | 3Hrs | 50 Marks | 20 Marks |

| Semester | Code of the Course | Title of the Course/Paper | NHEQF Level | Credits |
|---|---|---|---|---|
| I | UG0803-MAT-51T-101 | CALCULUS & Optimization Techniques | 5 | 4 |
| | UG0803-MAT-51P-101 | Practical/ Lab work-Optimization Techniques | 5 | 2 |
| Level of Course | Type of the Course | Delivery Type of the Course | | |
| Introductory | UG | Lecture, Sixty lectures | | |
| Prerequisites | Mathematics course of XII std. of Central Board of Secondary Education or equivalent. | | | |
| Objectives of the Course: | The objective of the course is to provide students with a comprehensive understanding of the fundamental concepts of calculus as a tool for dynamic systems and also develop the skill to utilize theoptimization techniques in real world. | | | |

# Syllabus

## UG0803-MAT-51T-101-Calculus& Optimization Techniques

**Teaching: 4 Hours per Week**                   **Duration of Examination: 3 Hours**
**Maximum Marks: 100 Marks**
**Minimum Passing Marks: 40 Marks**

The Question Paper will be divided into two parts, Part-A and Part-B.
Part-A contains one compulsory question consisting of 8 short answer type questions, These 8 short answer questions are selected from all the units, with two questions from each unit.The Part-A of the question paper evaluates the candidate's knowledge, understanding, and application of the topics/texts covered in the syllabus.
Part-B comprises four questions with one question from each unit, each carrying 20 marks. Each question in Part-B has four subparts. The candidate must attempt all four units by selecting any two subparts from each question. Each subpart within a question carries equal marks.

Note: The question Paper will be set in both Hindi and English.

### Unit I

Taylor's theorem.Maclaurin's theorem.Power series expansion of a function. Power series expansion of $\sin x$, $\cos x$, $e^x$, $\log_e(1+x)$, $(1+x)^n$ . Derivative of the length of an arc. Pedal equations.Curvature: Various formulae, Centre of curvature and Chord of curvature. Partial differentiation.Euler's theorem for homogeneous functions.Chain rule of partial differentiation.Total differentiation, Differentiation of implicit functions.

### Unit II

Envelopes: One parameter family of curves when two parameters are connected by a relation. Maxima and Minima of functions of two variables.Lagrange's method of undetermined multipliers. Asymptotes: Definition, Parallel to coordinate axes, General rational algebraic curves, inspection method, Intersection of a curve and its asymptotes. Multiple points. Curve tracing of standard curves (Cartesian and Polar curves).

### Unit III

Beta and Gamma functions, Reduction formulae (simple standard formulae), Double integrals in Cartesian and Polar Coordinates, Change of order of integration. Triple integrals. Dirichlet's integral. Rectification, Area, Volume and Surface of solids of revolution.

### Unit IV

Linear programming problems.Basic solution.Some basic properties and theorems on convex sets.Simplex algorithm.Duality, Solution of dual problems.

## Suggested Books and References –

1. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand & Co., N. D., 2013.

2. H.S.Dhami, Differential Calculus, Age Int. Ltd., New Delhi, 2012.
3. M. J. Strauss, G. L Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
4. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
5. G.B. Thomas, R. L. Finney, M. 13. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.
6. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.
7. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.

## Course Learning Outcomes:

By the end of the course, students should be able to:
1. Understand the concept of curvature and padel equations.
2. Understand the concept of maxima-minima, double triple integration and its allpications.
3. To understand mathematical formulation of optimization problems and allied theoretical concepts for solution methodologies.

## UG0803-MAT-51P-101-Practical / Lab Work-Optimization Techniques

**Teaching: 4 Hours per Weekper Batch**  **Duration of Examination: 3 HoursMaximum Marks: 50 Marks**
**Distribution of Marks: 15 marks for each practical, 10 marks for record of Lab work and 10 marks forViva-voce**
**Minimum Passing Marks: 20 Marks**

The Practical / Lab Work to be performed by using computer Language C++
Students are required to attempt one practical from each part.

Part-A:
1. Find the OptimumSolution of LPP by using Simplex method.
2. Find the Optimum Solution of Dual of LPP by using Simplex method.

Part-B:
1 Find the Optimum solution of given Transportation Problems.
2. Find the Optimum solution of given Assignment Problems.

# II- Semester - Mathematics
## (2023-2024 & onward)

| ype | Paper code and Nomenclature | Duration of Examination | Maximum Marks | Minimum Passing Marks |
|---|---|---|---|---|
| Theory | UG0803-MAT-52T-103- Discrete Mathematics &Vector Calculus | 3 Hrs | 100 Marks | 40 Marks |

| Semester | Code of the Course | Title of the Course/Paper | NHEQF Level | Credits |
|---|---|---|---|---|
| II | UG0803-MAT-52T-103 | Discrete Mathematics & Vector Calculus | 5 | 4 |
| | UG0803-MAT-52P-103 | Practical /Lab Work - Graph Theory | 5 | 2 |
| Level of Course | Type of the Course | Delivery Type of the Course | | |
| Introductory | UG | Lecture, Sixty lectures | | |
| Prerequisites | Mathematics course of XII std. of Central Board of Secondary Education or equivalent. | | | |
| Objectives of the Course: | The objective of the course is to expose discrete structures and involved topology, an optimization of real-world problems and to emphasize the applications of Vector Calculus in various fields. | | | |

# Syllabus

## UG0803-MAT-52T-103-Discrete Mathematics&Vector Calculus

**Teaching: 4 Hours per Week**                                    **Duration of Examination: 3 HoursMaximum Marks :100 Marks**
**Minimum Passing Marks: 40 Marks**

The Question Paper will be divided into two parts, Part-A and Part-B.
Part-A contains one compulsory question consisting of 8 short answer type questions, These 8 short answer questions are selected from all the units, with two questions from each unit.The Part-A of the question paper evaluates the candidate's knowledge, understanding, and application of the topics/texts covered in the syllabus
Part-B: Part-B comprises four questions with one question from each unit, each carrying 20 marks. Each question in Part-B has four subparts. The candidate must attempt all four units by selecting any two subparts from each question. Each subpart within a question carries equal marks.

Note: The question Paper will be set in both Hindi and English.

### Unit - I

Relations on a set, Equivalence class, partial order relations, Chains and Anti-chains. Lattices, Distributive and Complemented Lattices.Boolean algebra, conjunctive normal form, disjunctive normal form. Pigeon hole principle. Principle of inclusion and exclusion.Propositional calculus, Basic logical operations, Truth tables, Tautologies and contradictions.

### Unit - II

Discrete numeric functions, Generating functions, Recurrence relations, linear recurrence relation with constant coefficients and their solutions, Total solutions, Solution by the method of generating functions. Basic concepts of graph theory, Types of graphs, Planar graphs, Walks, Paths & Circuits, Shortest path problem.

### Unit - III

Planar graphs, Operations on graphs (union, join, products). Matrix representation of graphs, Adjacency matrices, Incidence matrices.Hamiltonian and Eulerian graphs. Tree, Spanning tree, Minimum spanning tree, Distance between vertices, Center of tree, Binary tree, Rooted tree.

### Unit–IV

Scalar and Vector point functions. Differentiation of vector point functions Directional derivative. Differential operators.Gradient, Divergence and Curl. Integration of vector point functions. Line, Surface and Volume integral, Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

### Suggested Books and References –

1. V.K.Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-GrawHiils, New Delhi, 2003.

### Course Learning Outcomes:

The course would enable the student.

1. To understand the ideas in discrete structures viz. Partially ordered sets, Lattices, Graphs etc. and allied conceptual intricacies with applications.
2. Understand the concept of vector calculus viz. operators, vector integration.


## UG0803-MAT-52P-103-Practical /Lab Work -Graph Theory

**Teaching: 4 Hours per Weekper Batch**          **Duration of Examination: 3 HoursMaximum Marks: 50 Marks**
**Distribution of Marks: 15 marks for each practical, 10 marks for record of Lab work and 10 marks forViva-voce**
**Minimum Passing Marks: 20 Marks**

The Practical / Lab Work to be performed by using computer Language C++
Students are required to attempt one practical from each part.

Part-A:

1. Find the vertices, even vertices, odd vertices and number of edges in the graphs & Directed graphs.

2. Find the union, intersection, ring sum, Productand Cartesian product of two graphs.

3. Find the solution of Travelling salesman problem.

Part-B:

1 Find shortest path between two vertices using Dijkstra Algorithm
2. Find minimum spanning tree using Prim's Algorithm
3. Find minimum spanning tree using Kruskal's Algorithm