# DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM & MARKING SCHEME

# B.Sc. III, IV, V, VI Semester

# MATHEMATICS

## (Based on Choice Based Credit System)

**SESSION : 2024-25**

**ESTD : 1958**


## GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

**(Former Name – Govt. Arts & Science College, Durg)**

**NAAC Accredited Grade A+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)**

**Phone : 0788-2212030**

**Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com**

# DEPARTMENT OF MATHEMATICS

## GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

### SYLLABUS for B.Sc. Semester – III

The syllabus with the paper combinations and Marking Scheme for the session 2024-2025.

| Title | Paper No. | Title of the Paper | Marks Allotted | | Credit |
|---|---|---|---|---|---|
| | | | Theory | Practical / Project | |
| Core Course (DSC) | BMT101 | Abstract Algebra | 100 | 50 | 4(3 + 1) |
| Discipline Specific Elective (DSE) | | Advanced Calculus | 100 | | |
| Skill Enhancement Course (SEC) (Anyone) | BMTSE01 | Introduction to Logic | 25 | 25 | 2(1+1) |
| | BMTSE02 | Vector Calculus | 25 | 25 | 2(1+1) |

The syllabus for **B.Sc. Semester - III** is hereby approved by the members of Board of Studies for the session 2024-25.

**In case any change or modification is prescribed by Central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.**

**Name & Signature:**

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6/7/24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - 06/07/24 | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – III | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **ABSTRACT ALGEBRA** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Recognize the mathematical objects that are groups and classify them as abelian, cyclic and permutation groups, etc.<br>• Analyze the subgroups of cyclic groups.<br>• Explain the significance of the notion of cosets, normal subgroups, and factor groups.<br>• Analyze the Homomorphisms and isomorphisms of groups. | | |
| 5 | Credit Value | **3C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Groups and its Elementary Properties**<br>Definition and examples of groups, Elementary Properties of groups, Symmetric group, Abelian Group, The Dihedral groups. Modulo, its properties and examples. | 09 |
| II | **Subgroups**<br>Subgroups and examples of subgroups, Centralizer, Normalizer, Center of a group, Product of two subgroups. | 09 |
| III | **Cyclic Groups and Lagrange's Theorem**<br>Cyclic groups, Properties of Cyclic groups, Normal subgroups, Cosets, Properties of Cosets, Factor groups, Lagrange's theorem. | 09 |
| IV | **Permutation Groups**<br>Permutation groups, Cycle notation for permutations, Properties of Permutations, Even and odd Permutations, alternating groups | 09 |
| V | **Group Homomorphisms**<br>Group homomorphisms, Properties of homomorphisms, Kernel of homomorphism, Group isomorphisms, Cayley's theorem, Properties of isomorphisms, First, Second and Third isomorphism theorem for groups. | 09 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6-07-24
Subject Expert - Dr. Madhu Shrivastava
Subject Expert - Dr. Shabnam Khan
Subject Expert - Dr. S. K. Bhatt 6/7/24
**Representative Members**
1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –
Dr. Rakesh Tiwari –
Dr. (Smt.) Prachi Singh –

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**References:**


1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited, Delhi. Fourth Impression, 2015.
2. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul : Basic Abstract Algebra,Cambridge University press.
3. I.N. Herstein: Topics in Algebra, Wiley Eastern Ltd.
4. Quazi Zameeruddin and Surjeet Singh : Modern Algebra.
5. A.R. Vasishtha, A.K.Vasishtha: Modern Algebra, Krishna's Educational Publisher.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals):**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epgp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

**Maximum Marks:** **100 Marks**

**Continuous Comprehensive Evaluation (CCE):** **20 Marks**

**Semester End Exam (SEE):** **80 Marks**

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br><br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br><br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br><br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. | Semester - III | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Lab Course** | | |
| 3 | Course Type | Discipline Specific Course (**DSC**) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Gain proficiency in plotting and analyzing various mathematical functions using coding techniques.<br>• Develop skills in graphical representation and interpretation of polynomial functions and their derivatives.<br>• Understand the impact of parameters on function behavior and graphical representations through practical applications. | | |
| 5 | Credit Value | **1C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :50 | | Minimum Passing Marks:20 |

| **S.No.** | **List of Experiments** |
|---|---|
| **1** | Plotting all symmetry of dihedral groups. |
| **2** | Finding order of subgroup of cyclic group of finite order. |
| **3** | Finding number of elements of group of finite order. |
| **4** | Subgroup of Symmetric Group $S_n$ and Alternating Group $A_n$. |
| **5** | Plotting graph of Homomorphism, Isomorphism and Automorphism of Group. |
| **6** | Describing group and its subgroups of order 15, 21, 30, 45 and 60. |
| **7** | Finding cosets and factor group of **Q/Z.** |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 5/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt 6.7.24

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

| **Part C - Learning Resource** | |
|---|---|
| Text Books, Reference Books, Other Resources | |
| **Books Recommended**<br>1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning<br>India Private Limited, Delhi. Fourth Impression, 2015.<br>1. Algebra 2nd adition by Michel Artin . | |
| **Part D: Assessment and Evaluation** | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks:** **50 Marks**<br>**(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)** | |
| **Semester End Exam (SEE)** | Laboratory performance: As per Dept. (LOCF) |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**

**FOUR YEAR UNDERGRADUATE PROGRAM**

**DEPARTMENT OF MATHEMATICS**

**COURSE CURRICULUM 2024-25**

**DSE**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – III | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Advanced Calculus** | | |
| 3 | Course Type | Discipline Specific Elective **(DSE)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Calculate the limit and examine the continuity and understand theconcepts of limit, continuity and differentiability of functions of more than one variable with geometrical interpretation.<br>• To Understand the concepts of mean value theorems with their applications.<br>• To understand the concept of maxima and minima for functions of two and three variables with their uses and techniques.<br>• Understand conceptual variations while advancing from one variable to several variables in calculus.<br>• Understand the concept of integration of functions of two and three variables and their evaluation technique with emphasis on beta and gamma functions. | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods =~~45~~ 60 Periods (~~45~~ 60 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | Limit and continuity of function of two and three variables. Mean value theorems of function of two variables- First mean value theorem and taylor's theorem. | ~~09~~ 12 |
| II | Partial Derivation and differentiability of function of two variables. Schwartz's theorem, Young's theorem, Implicit function theorem. Fourier series, Fourier expansion of piece wise monotonic function. | ~~09~~ 12 |
| III | Jacobians, Maxima, Minima and saddle points of function of two variables. | ~~09~~ 12 |
| IV | Partial Differentiation and Euler's theorem on homogeneous functions, Change of variables. Lagrange's multipliers method. Envelopes, Evolutes | ~~09~~ 12 |
| V | Beta and Gamma function. Double and triple integrals. Dirichlet's integrals. Change of order of integration. | ~~09~~ 12 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**References:**


1. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd.
2. Mathematical Analysis, S.C. malik and S. Arora, New age international,Delhi
3. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.
4. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.
5. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs.
6. Principles of Mathematical analysis, W.Rudin,McGraw Hill Publication
7. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic
8. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epgp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

| | |
|---|---|
| **Maximum Marks:** | **100 Marks** |
| **Continuous Comprehensive Evaluation (CCE):** | **20 Marks** |
| **Semester End Exam (SEE):** | **80 Marks** |

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br><br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24 | **Faculty members:** |
| Subject Expert - Dr. Madhu Shrivastava 6-07-24 | Dr. M.A. Siddiqui – |
| Subject Expert - Dr. Shabnam Khan | |
| Subject Expert - Dr. S. K. Bhatt 6.7.24 | Dr. Rakesh Tiwari – |
| **Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – III/V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Introduction to Logic** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember results of Prepositions, truth table, negation, conjunction and disjunction and equivalence relation.<br>• Understand Logical equivalence, Predicates and Quantifiers. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | Introduction, propositions, truth table, negation, conjunction and Disjunction, implications, bi-conditional propositions, converse, contra positive and inverse propositions and precedence of logical operators. Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations. | 30 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| **References:**<br>1. R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson education, 1998.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 25 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 5 Marks**<br>**Semester End Exam (SEE): 20 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation(CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern - Attempt any five questions out of given ten questions. | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – III / V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Vector Calculus** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember scalar and vector product of three vectors and Reciprocal vector.<br>• Understand Vector differentiation, Gradient, divergence and curl.<br>• Apply Vector integration in various types of calculation. | | |
| 5 | Credit Value | 2C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | Scalar and vector product of three vectors. Product of four vectors. Reciprocal vector. Examples and Applications. Vector differentiation, Gradient, divergence and curl. Vector integration. Examples and Applications. | 30 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** |
|---|
| Textbooks, Reference Books, Other Resources |
| Reference<br>1. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.<br>2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999.<br>2. Shanti Narayan, A Text book of Vector Calculus, S.Chand & Co. New Delhi.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org |
| **Part D: Assessment and Evaluation** |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 25 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 5 Marks**<br>**Semester End Exam (SEE): 20 Marks** |

| | | |
|---|---|---|
| **Internal Assessment:**<br>Continuous Comprehensive Evaluation (CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern – **Attempt any five questions out of given ten questions.** | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>4. Dr. Anil Kashyap -<br>5. Shri A. K. Pandey -<br>6. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# DEPARTMENT OF MATHEMATICS

## GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

### SYLLABUS for B.Sc. Semester – IV

The syllabus with the paper combinations and Marking Scheme for the session 2024-2025.

| Title | Paper No. | Title of the Paper | Marks Allotted | | Credit |
|---|---|---|---|---|---|
| | | | Theory | Practical / Project | |
| Core Course(DSC) | BMT101 | Real Analysis | 100 | 50 | 4(3 + 1) |
| Discipline Specific Elective (DSE) | | Mechanics | 100 | | |
| Skill Enhancement Course(SEC) (Anyone) | BMTSE01 | Set Theory | 25 | 25 | 2(1+1) |
| | BMTSE02 | Boolean Algebra | 25 | 25 | 2(1+1) |

The syllabus for **B.Sc. Semester - IV** is hereby approved by the members of Board of Studies for the session 2024-25.

**In case any change or modification is prescribed by Central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.**

**Name & Signature:**

**Chairperson / H.O.D** - Dr. Padmavati

Subject Expert - Dr. Madhu Shrivastava

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**

**FOUR YEAR UNDERGRADUATE PROGRAM**

**DEPARTMENT OF MATHEMATICS**

**COURSE CURRICULUM 2024-25**

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Four Year Undergraduate Program | | Class: B.Sc. Semester – IV | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Real Analysis** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Understand many properties of the real line and learn to define sequence in terms of functions from N to a subset of Real number.<br>• Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.<br>• Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. | | |
| 5 | Credit Value | **3C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Real Number System**<br>Algebraic and order properties of Absolute value of a real number; Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of Real number. | 09 |
| II | **Properties of Real Number System**<br>The completeness property of R, Archimedean property, Denseness of rational numbers in R. Definition and types of intervals, Nested intervals, Neighborhood of a point in R, Open and closed sets in real number. | 09 |
| III | **Sequences**<br>Convergent sequence, Limit of a sequence, Bounded sequence, Limit theorems, Monotone sequences, Monotone convergence theorem, Subsequences, Bolzano-Weierstrass theorem for sequences, Limit superior and limit inferior for bounded sequence, Cauchy sequence, Cauchy's convergence criterion. | 09 |
| IV | **Infinite Series**<br>Convergence and divergence of infinite series of real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series: Integral test, Basic comparison test, Limit comparison test, D'Alembert's ratio test, Cauchy's *n*-th root test. | 09 |
| V | **Alternating Series**<br>Alternating series, Leibniz test, Absolute and conditional convergence, Abel's test, Dirichlet test, Test for absolute Convergence. | 09 |

6-07-24

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| **References:**<br>1. Bartle, Robert G., & Sherbert, Donald R. (2015). *Introduction to Real Analysis* (4th ed.). Wiley India Edition. New Delhi.<br>**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in<br>2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in<br>4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks:** **100 Marks**<br>**Continuous Comprehensive Evaluation (CCE):** **20 Marks**<br>**Semester End Exam (SEE):** **80 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**

**FOUR YEAR UNDERGRADUATE PROGRAM**

**DEPARTMENT OF MATHEMATICS**

**COURSE CURRICULUM 2024-25**

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. | Semester - IV | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Lab Course** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Develop skills in solving and interpreting solutions of differential equations of various orders using practical methods.<br>• Gain proficiency in plotting and analyzing families of solutions for differential equations of second and third orders.<br>• Master techniques for solving systems of ordinary differential equations and interpreting their solutions in practical contexts. | | |
| 5 | Credit Value | **1C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :50 | | Minimum Passing Marks:20 |

| **S. No.** | **List of Experiments** |
|---|---|
| **1** | Find the sum of progression ( AP,GP,HP). |
| **2** | Finding sum of infinite series of Real number. |
| **3** | Finding limit superior and limit inferior of sequence by using software. |
| **4** | Plotting of graph of piecewise continuous function. |
| **5** | Plotting of Graph of Function which is continuous but not differentiable. |
| **6** | Plotting of graph of sequence of real number which is monotonic but not convergent. |
| **7** | Sketching graph of monotonic and bounded sequence of real number. |
| **8** | Plotting of graph of ε- δ definition of limit and continuity of function. |

6/7/24

| **Part C - Learning Resource** |
|---|
| Text Books, Reference Books, Other Resources |
| **Books Recommended:**<br>1. Introduction to Real Analysis by Robert G. Bartle abd Donald R. Sherbert.<br>2. Belinda Barners and Glenn R. Fulford, Mathematical Modeling with Case Studies, A Differential EquationApproach using Maple and Matlab, 2nd Ed., Taylor and Francis group, London and New York, 2009.<br>3. C.H. Edwards and D.E. Penny, Differential Equations and Boundary Value problems Computing andModeling, Pearson Education India, 2005.<br>4. Martha L Abell, James P Braselton, Differential Equations with MATHEMATICA, 3rd Ed., ElsevierAcademic Press, 2004. |
| **Part D: Assessment and Evaluation** |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 50 Marks**<br>**(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)** |

| | |
|---|---|
| **Semester End Exam (SEE)** | Laboratory performance: As per Dept. (LOCF) |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSE**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Four Year Undergraduate Program | | Class: B.SC. Semester – IV | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **MECHANICS** | | |
| 3 | Course Type | Discipline Specific Elective **(DSE)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Understand the concepts of stability and equilibrium, and test for determining stability.<br>• Apply the principle of virtual work to solve problems involving coplanar forces and simple frameworks.<br>• Analyse the geometric and intrinsic properties of catenary curves.<br>• Calculate projectile motion parameters, including trajectory, maximum height, time of flight, and horizontal range, with applications to real-world scenarios. | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Stable and Unstable Equilibrium:**<br>Stability, Stable and unstable equilibrium, Test for Determining the Nature of Stability. | 12 |
| II | **Virtual Work:**<br>Virtual Displacement and Virtual Work, Principle of Virtual Work for a System of Coplanar Forces Acting on a Particle and Different Points of a Rigid Body, Method of Solving the Problems, Problems on Simple Frame Work. | 12 |
| III | **Catenary:**<br>Definitions, Intrinsic Equation of the Common Catenary. Cartesian Equation of the Common Catenary, Geometrical Properties of the Catenary. | 18 |
| IV | **Projectile:**<br>Equation of Projectile, Vertex, Axis, Latus-Rectum, Focus and Directrix of the Trajectory, Velocity and Direction of the Projectile at a given time and at the given Height, Greatest Height of Projectile, Time of Flight, Horizontal Range, Maximum Horizontal Range. | 12 |
| V | **Applications:**<br>Sag of Telegraph Wires (Tightly Stretched Wire), Approximation to the Common Catenary, Projection on an Inclined Plane, The Range and Time of Flight Down an Inclined Plane. | 18 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt 6.7.24

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami - 06/07/24

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**References:**


1. R.S. Verma (1962). a text books of statics Pothishala Pvt. Ltd.
2. P.L. Shrivastava (1964). Elementary dynamics. Ram Narayan Lal, Beni Prasad Publishers Allahabad
3. A.S. Ramsey (2009), Statics, Cambridge University Press
4. A.S. Ramsey (2009), Dynamics, Cambridge University Press
5. S.L. Loney (2006) , An Elementary Treatise on the dynamics of a partical and of rigid bodies.
6. J.L. Synge an Griffith (1949). Principal of Mechanics, McGraw-Hill.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epgp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

| | |
|---|---|
| **Maximum Marks:** | **100 Marks** |
| **Continuous Comprehensive Evaluation (CCE):** | **20 Marks** |
| **Semester End Exam (SEE):** | **80 Marks** |

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt 6.7.24

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami - 06/07/24

**Faculty members:**

Dr. M.A. Siddiqui

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh

**GOVT. V.Y.T.PG.AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester– IV/VI | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Set Theory** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Apply Concepts of sets, subset, set operations and Venn diagram in real life problems<br>• Evaluate practical problems on counting principal and power set of a set. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | **Set Theory:** Sets, subsets, set operations, the low of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, Properties of empty set. Standard set operations. Classes of sets. Power set of a set. Difference and symmetric difference of two sets. Set identities, Generalized union and intersections and applications of above topics.<br>**Relation:** product set, composition of relations. Types of relations partitions and its applications, Equivalence Relations with example of congruence modulo relation. | 30 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - 06/07/24 | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| Reference<br>1. E. Kamke, Theory of sets, Dover Publishers, 1950.<br>2. P.R. Halmos, Naive set theory, Springer, 1974.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 25 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 5 Marks**<br>**Semester End Exam (SEE): 20 Marks** | | |
| **Internal Assessment:**<br>Continuous Comprehensive Evaluation (CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern -**Attempt any five questions out of given ten questions.** | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | |
|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – IV/VI | Session:2024-2025 |
| 1 | Course Code | | |
| 2 | Course Title | **Boolean Algebra** | |
| 3 | Course Type | Skill Enhancement Course (SEC) | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember properties of ordered sets, partial order sets, Hasse diagram, duality principal, maximal and minimal elements.<br>• Understand Lattices as ordered sets, complete lattices, lattices as algebraic structures, sub lattices, product and Homomorphism.<br>• Apply concepts of Karnaugh diagrams, switching circuits.<br>• Evaluate problems on Boolean algebras and its properties, Boolean polynomials, minimal forms of Boolean polynomials. | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** |
| 6 | Total Marks | Maximum Marks: 25 | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| I | Definition, examples and basic properties of ordered sets, maps between ordered sets, Partial ordered set, Hasse Diagram, duality principle, maximal and minimal elements. Lattices as ordered sets, complete lattices, lattices as algebraic structures, sub- lattices, products and Homomorphism. Definition, examples and properties of modular and distributive lattices, Complete lattice, Complemented lattice, Bounded lattice and some theorems. Boolean Algebra and its properties, Boolean polynomials, minimal forms of Boolean polynomials. Quinn-Mccluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits. | 30 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt 6.7.24

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

| **Part C - Learning Resource** |
|---|
| Text Books, Reference Books, Other Resources |
| **References:**<br>1. B. A. Davey and H.A. Priestley, Introduction to lattices and order. Cambridge university press, Cambridge, 1990.<br>2. Rudolf Lidl and Gunter Pilz, Applied Abstract Algebra, 2nd Ed., Undergraduate texts in mathematics, Springer (SIE), Indian reprint, 2004.<br>3. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing Company Limited.<br><br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org |

| **Part D: Assessment and Evaluation** | | |
|---|---|---|
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks:** **25 Marks**<br>**Continuous Comprehensive Evaluation (CCE):** **5 Marks**<br>**Semester End Exam (SEE):** **20 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation(CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern - Attempt any five questions out of given ten questions. | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# DEPARTMENT OF MATHEMATICS

## GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

### SYLLABUS for B.Sc. Semester – V

The syllabus with the paper combinations and Marking Scheme for the session 2024-2025.

| Title | Paper No. | Title of the Paper | Marks Allotted | | Credit |
|---|---|---|---|---|---|
| | | | Theory | Practical / Project | |
| Core Course (DSC) | BMT101 | Metric Space | 75 | 25 | 4(3 + 1) |
| Discipline Specific Elective (DSE) | | (A) Partial Differential Equation<br>(B) Numerical Methods | 100 | | 4 |
| Skill Enhancement Course (SEC) (Anyone) | BMTSE01 | Introduction to Logic | 25 | 25 | 2(1+1) |
| | BMTSE02 | Vector Calculus | 25 | 25 | 2(1+1) |

The syllabus for **B.Sc. Semester - V** is hereby approved by the members of Board of Studies for the session 2024-25.

**In case any change or modification is prescribed by Central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.**

**Name & Signature:**

**Chairperson / H.O.D** - Dr. Padmavati

Subject Expert - Dr. Madhu Shrivastava

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**

**FOUR YEAR UNDERGRADUATE PROGRAM**

**DEPARTMENT OF MATHEMATICS**

**COURSE CURRICULUM 2024-25**

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Metric Spaces** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Understand concepts of metric, distance, convergence, completeness, compactness, connectedness, Bolzano-Weierstrass property.<br>• Apply these concepts to key classes of spaces.<br>• Learn to analyze mapping between spaces.<br>• Identify the continuity of a function defined on metric spaces.<br>• Attain background for advanced courses in real analysis, functional analysis and topology. | | |
| 5 | Credit Value | **3C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :75 | | Minimum Passing Marks:30 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Concepts in metric spaces:** Definition and examples of metric spaces, Open spheres and closed spheres, Neighborhoods, Open sets, Interior, exterior and boundary points, Closed sets, Limit points and isolated points, Interior and closure of a set, Boundary of a set, Bounded sets, Distance between two sets, Diameter of a set, Subspace of a metric space. | 09 |
| II | **Complete Metric Spaces:** Convergent and Cauchy sequences, Completeness of metric spaces, Cantor's intersection theorem, Dense sets and separable spaces, Nowhere dense sets, Baire's category theorem. | 09 |
| III | **Continuous Functions:** Continuous functions, Extension and Restriction Functions, Uniform Continuous Functions, Isometry, Open mapping, Homeomorphism, Contraction mapping, Fixed Point, Banach contraction principle. | 09 |
| IV | **Compactness:** Compact spaces, Sequential compactness, Bolzano-Weierstrass property, Compactness and finite intersection property, Heine-Borel theorem, Totally bounded sets, Equivalence of compactness and sequential compactness, Continuous functions on compact spaces. | 09 |
| V | **Connectedness:** Separated sets, Disconnected and connected sets, Components, Connected subsets of $\mathbb{R}$, Continuous functions on connected sets. | 09 |

06/07/24 6.7.24 6-07-24 6/7/24 6/7

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** |
|---|
| Text Books, Reference Books, Other Resources |
| **Reference:**<br>1. E. T. Copson (1988). Metric Spaces. Cambridge University Press.<br>2. P. R. Halmos (1974). Naive Set Theory. Springer.<br>3. P. K. Jain & Khalil Ahmad (2019). Metric Spaces. Narosa.<br>4. S. Kumaresan (2011). Topology of Metric Spaces (2nd edition). Narosa.<br>5. Satish Shirali & Harikishan L. Vasudeva (2006). Metric Spaces. Springer-Verlag.<br>6. Micheál O'Searcoid (2009). Metric Spaces. Springer-Verlag.<br>7. G. F. Simmons (2004). Introduction to Topology and Modern Analysis. McGraw Hill.<br>**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epqp.inflibnet.aci.in 4. https://www.mooc.org |

| **Part D: Assessment and Evaluation** | | |
|---|---|---|
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks:** **75 Marks**<br>**Continuous Comprehensive Evaluation (CCE):** **15 Marks**<br>**Semester End Exam (SEE):** **60 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 15 Marks<br>Assignment/ Seminar – one of 15 Marks | Best of Test and Assignment shall be considered against 15 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 02 x 5 = 10 Marks<br>Question-C: Short answer type questions 03 x 5 = 15 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 60 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Project** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Explore and comprehend the mathematical contributions of ancient Indian mathematicians.<br>• Develop contextual understanding of historical and cultural influences on their works.<br>• Fostering a deeper understanding of their impact on global mathematics. | | |
| 5 | Credit Value | **1C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks: 10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 15 Periods (15 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | **Project Topic:**<br>Examine the contributions and life stories of Indian mathematicians such as Baudhayana, Aryabhata, Bhaskara I, Hemachandra, Bhaskaracharya (Bhaskara II) (in special context of Lilavati), Madhava of Sangamagrama, Nilakantha Somayaji, and Srinivasa Ramanujan. Analyze their mathematical achievements in algebra, geometry, calculus, and other areas. exploring how their work has impacted mathematics globally. | **15** |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
## FOUR YEAR UNDERGRADUATE PROGRAM
## DEPARTMENT OF MATHEMATICS
## COURSE CURRICULUM 2024-25

**DSE**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Partial Differential Equations** | | |
| 3 | Course Type | Discipline Specific Elective (DSE) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Apply a range of techniques to solve first & second order partial differential equations.<br>• Model physical phenomena using partial differential equations such as the heat and wave equations.<br>• Understand problems, methods and techniques of calculus of variations. | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods =~~60~~ 60 Periods (~~60~~ 60 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **First Order Partial Differential Equations I:** Order and degree of Partial differential equations (PDE), Concept of linear and non-linear partial differential equations, Partial differential equations of the first order, Lagrange's method. | ~~09~~ 12 |
| II | **First Order Partial Differential Equations II:** Some special type of equation which can be solved easily by methods other than the general method (Standard Form I,II,III, and IV), Charpit's general method. | ~~09~~ 12 |
| III | **Second Order Partial Differential Equations with Constant Coefficients:** Classification of linear partial differential equations of second order, Homogeneous and nonhomogeneous equations with constant coefficients. | ~~09~~ 12 |
| IV | **Second Order Partial Differential Equations with Variable Coefficients:** Partial differential equations reducible to equations with constant coefficient, Second order PDE with variable coefficients, Classification of second order PDE, Reduction to canonical or normal form. | ~~09~~ 12 |
| V | **Application:** Monge's method; Solution of heat and wave equations in one and two dimensions by method of separation of variables. | ~~09~~ 12 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24
Subject Expert - Dr. Madhu Shrivastava 16-07-24
Subject Expert - Dr. Shabnam Khan 6.7.24
Subject Expert - Dr. S. K. Bhatt
**Representative Members**
1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami - 06/07/24

**Faculty members:**
Dr. M.A. Siddiqui –
Dr. Rakesh Tiwari –
Dr. (Smt.) Prachi Singh –

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**Reference:**


1. A. S. Gupta (2004). Calculus of Variations with Applications. PHI Learning.
2. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.
3. TynMyint-U & Lokenath Debnath (2013). Linear Partial Differential Equation for Scientists and Engineers (4th edition). Springer India.
4. H. T. H. Piaggio (2004). An Elementary Treatise on Differential Equations and Their Applications. CBS Publishers.
5. S. B. Rao & H. R. Anuradha (1996). Differential Equations with Applications. University Press.
6. Ian N. Sneddon (2006). Elements of Partial Differential Equations. Dover Publications.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epqp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

**Maximum Marks:** **100 Marks**

**Continuous Comprehensive Evaluation (CCE):** **20 Marks**

**Semester End Exam (SEE):** **80 Marks**

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br><br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br><br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br><br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSE**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Numerical Methods** | | |
| 3 | Course Type | Discipline Specific Elective **(DSE)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• The aim of this course is to teach the student the application of various numerical techniques for a variety of problems occurring in daily life.<br>• The main outcome will be that students will be able to handle problems and find approximated solutions.<br>• Obtain numerical solutions of algebraic and transcendental equations.<br>• Find numerical solutions of system of linear equations and to check the accuracy of the solutions.<br>• Learn about various interpolating and extrapolating methods to find numerical solutions. | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = ~~60~~ Periods (~~60~~ Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Fundamentals of Numerical Methods**<br>Round-off error and computer arithmetic, local and global truncation errors, algorithms and convergence. | ~~09~~ 12 |
| II | **Root Finding Methods**<br>Bisection method, false position method, fixed point iteration method, Newton's method, secant method. | ~~09~~ 12 |
| III | **Interpolation and Approximation**<br>Lagrange and Newton interpolations, piecewise linear interpolation, cubic spline interpolation, finite difference operators, Gregory Newton forward and backward difference interpolations. | ~~09~~ 12 |
| IV | **Numerical Differentiation and Integration**<br>First order and higher order approximation for first derivative, approximation for second derivative. trapezoidal rule, Simpson's rule and its error analysis, Bulirsch-Stoer extrapolation methods, Richardson extrapolation. | ~~09~~ 12 |
| V | **Numerical Solutions of Differential Equations**<br>Euler's method, Runge-Kutta methods, higher order one-step method, multi-step methods. Finite difference method, shooting method. | ~~09~~ 12 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24
Subject Expert - Dr. Madhu Shrivastava 6-07-24
Subject Expert - Dr. Shabnam Khan
Subject Expert - Dr. S. K. Bhatt
**Representative Members**
1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –
Dr. Rakesh Tiwari –
Dr. (Smt.) Prachi Singh –

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| **Reference:**<br>• M.K. Jain, S. R. K. Iyengar& R. K. Jain (2012). Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers.<br>• C. F. Gerald & P. O. Wheatley (2008). Applied Numerical Analysis (7th edition), Pearson Education, India.<br>• Brian Bradie (2006), A Friendly Introduction to Numerical Analysis. Pearson.<br>• Robert J. Schilling & Sandra L. Harris (1999). Applied Numerical Methods for Engineers Using MATLAB and C. Thomson-Brooks/Cole.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epqp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 100 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 20 Marks**<br>**Semester End Exam (SEE): 80 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – III/V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Introduction to Logic** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember results of Prepositions, truth table, negation, conjunction and disjunction and equivalence relation.<br>• Understand Logical equivalence, Predicates and Quantifiers. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | Introduction, propositions, truth table, negation, conjunction and Disjunction, implications, bi-conditional propositions, converse, contra positive and inverse propositions and precedence of logical operators. Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations. | 30 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt 6.7.24

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami - 06/07/24

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

| Learning Resource |
|---|
| Text Books, Reference Books, Other Resources |
| **Reference:** 1. R. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson education, 1998. **Online Resources: (e- Resources/ e- Books/ e- Learning Portals)** 1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in 3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org |

| **Part D: Assessment and Evaluation** | | |
|---|---|---|
| **Suggested Continuous Evaluation Methods:** | | |
| **Maximum Marks:** | **25 Marks** | |
| **Continuous Comprehensive Evaluation (CCE):** | **5 Marks** | |
| **Semester End Exam (SEE):** | **20 Marks** | |
| **Internal Assessment:** Continuous Comprehensive Evaluation(CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern - Attempt any five questions out of given ten questions. | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt 6.7.24<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – III / V | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Vector Calculus** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember scalar and vector product of three vectors and Reciprocal vector.<br>• Understand Vector differentiation, Gradient, divergence and curl.<br>• Apply Vector integration in various types of calculation. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | Scalar and vector product of three vectors. Product of four vectors. Reciprocal vector. Examples and Applications. Vector differentiation, Gradient, divergence and curl. Vector integration. Examples and Applications. | 30 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati

Subject Expert - Dr. Madhu Shrivastava

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

| **Part C - Learning Resource** |
|---|
| Textbooks, Reference Books, Other Resources |
| Reference<br><br>1. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.<br>2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999.<br>2. Shanti Narayan, A Text book of Vector Calculus, S.Chand & Co. New Delhi.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br><br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org |

| **Part D: Assessment and Evaluation** | | |
|---|---|---|
| **Suggested Continuous Evaluation Methods:** | | |
| **Maximum Marks:** | **25 Marks** | |
| **Continuous Comprehensive Evaluation (CCE):** | **5 Marks** | |
| **Semester End Exam (SEE):** | **20 Marks** | |
| **Internal Assessment:**<br>Continuous Comprehensive Evaluation (CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern – **Attempt any five questions out of given ten questions.** | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>4. Dr. Anil Kashyap -<br>5. Shri A. K. Pandey -<br>6. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# DEPARTMENT OF MATHEMATICS

## GOVT. V.Y. T. PG. AUTONOMOUS COLLEGE, DURG

### SYLLABUS for B.Sc. Semester – VI

The syllabus with the paper combinations and Marking Scheme for the session 2024-2025.

| Title | Paper No. | Title of the Paper | Marks Allotted | | Credit |
|---|---|---|---|---|---|
| | | | Theory | Practical / Project | |
| Core Course (DSC) | BMT101 | Complex Variables and Trigonometry | 75 | 25 | 4(3 + 1) |
| Discipline Specific Elective (DSE) | | (A)Linear Algebra<br>(B)Integral Transforms | 100 | | |
| Skill Enhancement Course (DSC) (Anyone) | BMTSE01 | Set Theory | 25 | 25 | 2(1+1) |
| | BMTSE02 | Boolean Algebra | 25 | 25 | 2(1+1) |

The syllabus for **B.Sc. Semester - VI** is hereby approved by the members of Board of Studies for the session 2024-25.

**In case any change or modification is prescribed by Central Board of Studies or Higher Education Dept., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.**

**Name & Signature:**

**Chairperson / H.O.D** - Dr. Padmavati 6/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

DSC

| Part A: Introduction | | | | |
|---|---|---|---|---|
| Program: | | Class: B.Sc. | Semester – VI | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Complex Variables and Trigonometry** | | |
| 3 | Course Type | Discipline Specific Course **(DSC)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Understand concepts of Complex numbers and its properties.<br>• Apply these concepts to key classes of spaces.<br>• Learn to analyze mapping between spaces.<br>• Identify the continuity of a function defined on complex spaces.<br>• Attain background for advanced courses in complex analysis. | | |
| 5 | Credit Value | **3C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Complex Numbers and Their Geometrical Representation:** Complex numbers as ordered pairs, Geometrical representation of complex numbers, Modulus and argument of complex numbers and its Properties, Equation of straight line and circle, Cauchy's inequality and Lagrange's identity. | 10 |
| II | **Limit, Continuity and Differentiability of Complex Functions and Analytic Functions:** Limit, Continuity, Differentiability of functions of a Complex variable. Analytic function, Cauchy – Riemann equations, Conjugate function, Laplace's Differential equations, Harmonic functions, Orthogonal system and Construction of Analytic function. | 12 |
| III | **Mobius Transformation:** Jacobian of Transformation, Linear Transformation, Mobius Transformation, Linear Group, Fixed point of Mobius transformation, Cross ratio, Inverse Point, Properties of Mobius transformation. | 10 |
| IV | **Trigonometry I:** De-Moivre's Theorem and its applications. Direct and inverse circular and hyperbolic functions. | 07 |
| V | **Trigonometry II:** Logarithm of a complex quantity. Expansion of Trigonometrical functions. Gregory's Series. Summation of series. | 06 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 6-07-24
Subject Expert - Dr. Madhu Shrivastava
Subject Expert - Dr. Shabnam Khan
Subject Expert - Dr. S. K. Bhatt
**Representative Members**
1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami - 06/07/24

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**Reference:**


1. R.V. Churchill & J.W. Brown, Complex Variables and Applications , 5th Edition, Mc-Graw Hill, New-York ,1990.
2. Mark J. Ablowitz & A.S. Focas, Complex Variables : Introduction and Applications, Cambridge University Press South Asian Edition, 1998.
3. Shanti Narayan, Theory and Functions of a Complex Variable, S. Chand & Company New-Delhi. E.T. Copson. Metric Spaces Cambridge University Press , 1968.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epgp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

| | |
|---|---|
| **Maximum Marks:** | **75 Marks** |
| **Continuous Comprehensive Evaluation (CCE):** | **15 Marks** |
| **Semester End Exam (SEE):** | **60 Marks** |

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 15 Marks + Assignment/ Seminar – one of 15 Marks | Best of Test and Assignment shall be considered against 15 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 02 x 5 = 10 Marks<br>Question-C: Short answer type questions 03 x 5 = 15 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 60 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSE**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. | Semester – VI | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Linear Algebra** | | |
| 3 | Course Type | Discipline Specific Elective (DSE) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.<br>• Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations.<br>• Learn properties of inner product spaces and determine orthogonality in inner product spaces.<br>• Realize importance of adjoint of a linear transformation and its canonical form | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = ~~60~~ Periods (~~60~~ Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Vector Spaces**<br>Definition and examples of Vector space and Subspace, Linear span, Quotient space and direct sum of subspaces, Linearly independent and dependent sets, Bases and dimension | ~~09~~ 12 |
| II | **Linear Transformations**<br>Definition and examples, Algebra of linear transformation, Matrix of a linear transformation, Change of coordinates, Rank and nullity of a linear transformation and rank-nullity theorem. | ~~09~~ 12 |
| III | **Further Properties of Linear Transformations**<br>Isomorphism of vector spaces, Isomorphism theorems, Transpose of a linear transformation, Eigen vectors and eigen values of a linear transformation, Characteristic polynomial and Cayley–Hamilton theorem. | ~~09~~ 12 |
| IV | **Inner Product Spaces**<br>Inner product spaces and orthogonality, Cauchy–Schwarz inequality, Gram–Schmidt orthogonalization, Diagonalization of symmetric matrices. | ~~09~~ 12 |
| V | **Adjoint of a Linear Transformation and Canonical Forms**<br>Adjoint of a linear operator; Hermitian, unitary and normal linear transformations; Jordan canonical form, Triangular form, Trace and transpose, Invariant subspaces. | ~~09~~ 12 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati
Subject Expert - Dr. Madhu Shrivastava
Subject Expert - Dr. Shabnam Khan
Subject Expert - Dr. S. K. Bhatt
**Representative Members**
1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –
Dr. Rakesh Tiwari –
Dr. (Smt.) Prachi Singh –

**Part C - Learning Resource**

Text Books, Reference Books, Other Resources

**Reference:**


1. Stephen H. Friedberg, Arnold J. Insel & Lawrence E. Spence (2003). Linear Algebra (4thedition). Prentice-Hall of India Pvt. Ltd.
2. Kenneth Hoffman & Ray Kunze (2015). Linear Algebra (2nd edition). Prentice-Hall.
3. I.M. Gel'fand (1989). Lectures on Linear Algebra. Dover Publications.
4. Nathan Jacobson (2009). Basic Algebra I & II (2nd edition). Dover Publications.
5. Serge Lang (2005). Introduction to Linear Algebra (2nd edition). Springer India.
6. Vivek Sahai & Vikas Bist (2013). Linear Algebra (2nd Edition). Narosa Publishing House.
7. Gilbert Strang (2014). Linear Algebra and its Applications (2nd edition). Elsevier.


**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

1. https://onlinecourses.nptel.ac.in
2. https://swayam.gov.in
3. https://epgp.inflibnet.aci.in
4. https://www.mooc.org

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

| | |
|---|---|
| **Maximum Marks:** | **100 Marks** |
| **Continuous Comprehensive Evaluation (CCE):** | **20 Marks** |
| **Semester End Exam (SEE):** | **80 Marks** |

| | | |
|---|---|---|
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br><br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br><br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br><br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati 5/7/24

Subject Expert - Dr. Madhu Shrivastava 6-07-24

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

DSE

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – VI | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Integral Transforms** | | |
| 3 | Course Type | Discipline Specific Elective **(DSE)** | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Know about piece wise continuous functions, Dirac delta function, Laplace transforms and its properties.<br>• Solve ordinary differential equations using Laplace transforms.<br>• Explain Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems. | | |
| 5 | Credit Value | 4C | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks :100 | | Minimum Passing Marks:40 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 60 Periods (60 Hours)**

| Unit | Topics (COURSE CONTENTS) | No. of Periods |
|---|---|---|
| I | **Laplace Transforms Basics**<br>Integral Transform, Kernel of an Integral Transform, Reduction of Integral Transform into Laplace Transform, Linearity, Existence Theorem. | 09 12 |
| II | **Applications of Laplace Transforms**<br>Laplace Transforms of Derivatives and Integrals, Shifting Theorems, Change of Scale Property, Laplace Transforms of Periodic Functions, Dirac's Delta Function, Differentiation and Integration of Transforms. | 09 12 |
| III | **Inverse Laplace Transform and Applications**<br>Convolution Theorem, Integral Equations, Inverse Laplace Transform, Lerch's Theorem, Linearity Property of Inverse Laplace Transform, Translation Theorems of Inverse Laplace Transform, Inverse Transform of Derivatives. | 09 12 |
| IV | **Fourier Transforms Fundamentals**<br>Fourier and Inverse Fourier Transforms, Fourier Sine and Cosine Transforms, Inverse Fourier Sine and Cosine Transforms, Linearity Property, Change of Scale Property, Shifting Property. | 09 12 |
| V | **Applications of Fourier Transforms**<br>Solution of Integral Equation by Fourier Sine and Cosine Transforms, Convolution Theorem for Fourier Transform, Parseval's Identity for Fourier Transform, Plancherel's Theorem, Fourier Transform of Derivatives, Applications of Infinite Fourier Transforms to Boundary Value Problems, Finite Fourier Transform, Inversion Formula for Finite Fourier Transforms. | 09 12 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| **Reference:**<br>1. James Ward Brown & Ruel V.Churchill. Fourier Series and Boundary Value Problems. McGraw-Hill Education. 2011<br>2. Charles K.Chui. An Introduction to Wavelets. Academic Press 1992<br>3. Erwin Kreyszig. Advanced Engineering Mathematics(10thedition). Wiley. 2011<br>4. Walter Rudin. Fourier Analysison Groups. Dover Publications. 2017<br>5. A. Zygmund. Trigonometric Series (3rdedition). Cambridge University Press. 2002<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epqp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part** D: **Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 100 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 20 Marks**<br>**Semester End Exam (SEE): 80 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation (CCE) | Internal Test – 20 Marks<br>Assignment/ Seminar – one of 20 Marks | Best of Test and Assignment shall be considered against 20 marks |
| **Semester End Exam (SEE)** | Pattern -**FOUR Question** A, B, C, D from each unit. Question A and B are compulsory. Question C and D have internal choice.<br>Question-A & B (Compulsory): Very short answer type question (2 each) 04 x 5 = 20 Marks<br>Question-C: Short answer type questions 05 x 5 = 25 Marks<br>Question-D: Long answer type questions 07 x 5 = 35 Marks<br>Total = 80 Marks | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati 6/7/24<br>Subject Expert - Dr. Madhu Shrivastava 6-07-24<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester– IV/VI | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Set Theory** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Apply Concepts of sets, subset, set operations and Venn diagram in real life problems<br>• Evaluate practical problems on counting principal and power set of a set. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| I | **Set Theory:** Sets, subsets, set operations, the low of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, Properties of empty set. Standard set operations. Classes of sets. Power set of a set. Difference and symmetric difference of two sets. Set identities, Generalized union and intersections and applications of above topics.<br>**Relation:** product set, composition of relations. Types of relations partitions and its applications, Equivalence Relations with example of congruence modulo relation. | 30 |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| Reference<br>1. E. Kamke, Theory of sets, Dover Publishers, 1950.<br>2. P.R. Halmos, Naive set theory, Springer, 1974.<br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks:** **25 Marks**<br>**Continuous Comprehensive Evaluation (CCE):** **5 Marks**<br>**Semester End Exam (SEE):** **20 Marks** | | |
| **Internal Assessment:**<br>Continuous Comprehensive Evaluation (CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern -**Attempt any five questions out of given ten questions.** | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

**GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG**
**FOUR YEAR UNDERGRADUATE PROGRAM**
**DEPARTMENT OF MATHEMATICS**
**COURSE CURRICULUM 2024-25**

**SEC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.SC. Semester – IV/VI | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Boolean Algebra** | | |
| 3 | Course Type | Skill Enhancement Course (SEC) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Remember properties of ordered sets, partial order sets, Hasse diagram, duality principal, maximal and minimal elements.<br>• Understand Lattices as ordered sets, complete lattices, lattices as algebraic structures, sub lattices, product and Homomorphism.<br>• Apply concepts of Karnaugh diagrams, switching circuits.<br>• Evaluate problems on Boolean algebras and its properties, Boolean polynomials, minimal forms of Boolean polynomials. | | |
| 5 | Credit Value | **2C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks:10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 30 Periods (30 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | Definition, examples and basic properties of ordered sets, maps between ordered sets, Partial ordered set, Hasse Diagram, duality principle, maximal and minimal elements. Lattices as ordered sets, complete lattices, lattices as algebraic structures, sub- lattices, products and Homomorphism. Definition, examples and properties of modular and distributive lattices, Complete lattice, Complemented lattice, Bounded lattice and some theorems. Boolean Algebra and its properties, Boolean polynomials, minimal forms of Boolean polynomials. Quinn-Mccluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits. | 30 |

Name & Signature of Members of Board of Studies:

**Chairperson / H.O.D** - Dr. Padmavati

Subject Expert - Dr. Madhu Shrivastava

Subject Expert - Dr. Shabnam Khan

Subject Expert - Dr. S. K. Bhatt

**Representative Members**

1. Dr. Anil Kashyap -
2. Shri A. K. Pandey -
3. Dr. Mayur Puri Goswami -

**Faculty members:**

Dr. M.A. Siddiqui –

Dr. Rakesh Tiwari –

Dr. (Smt.) Prachi Singh –

| **Part C - Learning Resource** | | |
|---|---|---|
| Text Books, Reference Books, Other Resources | | |
| **References:**<br>1. B. A. Davey and H.A. Priestley, Introduction to lattices and order. Cambridge university press, Cambridge, 1990.<br>2. Rudolf Lidl and Gunter Pilz, Applied Abstract Algebra, 2nd Ed., Undergraduate texts in mathematics, Springer (SIE), Indian reprint, 2004.<br>3. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing Company Limited.<br><br>**Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org | | |
| **Part D: Assessment and Evaluation** | | |
| **Suggested Continuous Evaluation Methods:**<br>**Maximum Marks: 25 Marks**<br>**Continuous Comprehensive Evaluation (CCE): 5 Marks**<br>**Semester End Exam (SEE): 20 Marks** | | |
| **Internal Assessment:** Continuous Comprehensive Evaluation(CCE) | Assignment 05 Marks | Marks obtained in Assignment shall be considered against 05 marks |
| **Semester End Exam (SEE)** | Pattern - Attempt any five questions out of given ten questions. | |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

## FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF MATHEMATICS

## COURSE CURRICULUM 2024-25

**DSC**

| **Part A: Introduction** | | | | |
|---|---|---|---|---|
| Program: Bachelor's in science (Certificate /Diploma / Degree/Honors) | | Class: B.Sc. Semester – VI | | Session:2024-2025 |
| 1 | Course Code | | | |
| 2 | Course Title | **Project** | | |
| 3 | Course Type | Discipline Specific Course (**DSC**) | | |
| 4 | Course Learning Outcome (CLO) | **This Course will enable the students to:**<br>• Gain insight into significant advancements in algebra, geometry, calculus, and related fields by Indian mathematicians throughout history.<br>• Understand the cultural and historical contexts influencing the development of mathematical ideas in India.<br>• Analyze the lasting impact of Indian mathematical achievements on global mathematics. | | |
| 5 | Credit Value | **1C** | **1 credit =15 Hours – Learning and Observation** | |
| 6 | Total Marks | Maximum Marks: 25 | | Minimum Passing Marks: 10 |

**Part B: Content of the Course**

**Total no. of Teaching/ Learning Periods = 15 Periods (15 Hours)**

| **Unit** | **Topics (COURSE CONTENTS)** | **No. of Periods** |
|---|---|---|
| **I** | **Project Topic:**<br>Examine the contributions and life stories of Indian mathematicians such as Apastambha, Panini, Varahamihira, Brahmagupta, Parameshvara, Narayana Pandit, Kamalakara, and Jyeshtadeva. Analyze their achievements in algebra, geometry, calculus, and other areas, exploring how their work has left a lasting impact on mathematics worldwide. | **15** |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |

| **Part C - Learning Resource** |
|---|
| Text Books, Reference Books, Other Resources |
| **References:**<br>1. M. Chandra, History of Mathematics in India, Motilal Banarsidass Publishers, 2008.<br>2. B.L. Gupta, History of Indian Mathematics: Rich Traditions and Legacies, Springer, 2017.<br>3. George Gheverghese Joseph, The Crest of the Peacock: Non-European Roots of Mathematics, Princeton University Press, 2000.<br>4. Robert Kanigel, The Man Who Knew Infinity: A Life of the Genius Ramanujan, Washington Square Press, 1991.<br>**Online Resources: ( e- Resources/ e- Books/ e- Learning Portals):**<br>1. https://onlinecourses.nptel.ac.in 2. https://swayam.gov.in<br>3. https://epgp.inflibnet.aci.in 4. https://www.mooc.org |

| **Part D: Assessment and Evaluation** | |
|---|---|
| **Suggested Continuous Evaluation Methods:** | |
| **Maximum Marks:** | **25 Marks** |
| **Continuous Internal Assessment (CIA):** | **05 Marks** |
| **Project:** | **20 Marks** |
| **Internal Assessment:**<br>Continuous Comprehensive Evaluation (CCE) | Quiz (05 Marks) |
| **Project** | Project work (20 Marks) |

Name & Signature of Members of Board of Studies:

| | |
|---|---|
| **Chairperson / H.O.D** - Dr. Padmavati<br>Subject Expert - Dr. Madhu Shrivastava<br>Subject Expert - Dr. Shabnam Khan<br>Subject Expert - Dr. S. K. Bhatt<br>**Representative Members**<br>1. Dr. Anil Kashyap -<br>2. Shri A. K. Pandey -<br>3. Dr. Mayur Puri Goswami - | **Faculty members:**<br>Dr. M.A. Siddiqui –<br>Dr. Rakesh Tiwari –<br>Dr. (Smt.) Prachi Singh – |