To,

The Principal Secretary
Rajbhavan, Bihar, Patna.

Sub.- **Regarding submission of proposed course structure and uniform syllabus of ....MATHEMATICS..... for 1st and 2nd Semester of 4-Year undergraduate.**

Ref.- Letter No.-BSU(UGC)-02/2023-871/GS(I), Dated-09-06-2023

Sir,

In Compliance with your letter no.-BSU(UGC)-02/2023-871/GS(I), dated 09-06-2023 followed by above mentioned letter no, we are submitting the proposed course structure and syllabus of ...MATHEMATICS.....s for 1st and 2nd semester of the 4 year under graduate course system as per UGC regulations.

Yours faithfully,

Enclosed-as above.

(2 sets)

1. 14/06/2023
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4-Years Bachelor of Science/Arts (MATHEMATICS)

CBCS Syllabus

Semester-I

MJC-01: Algebra (06 credits) (Lecture: 60)

Course Objectives: The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory and matrices to understand their linkage to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Employ De Moivre's theorem in a number of applications to solve numerical problems.
ii) Apply Euclid's algorithm and backwards substitution to find greatest common divisor.
iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

Course Contents:

Unit 1 **(Lecture: 10)**
Polar representation of complex numbers, De -Moivre's theorem and its applications, Logarithms of complex quantities, Hyperbolic functions, Gregory series, Summation of series, Resolution into factors.

Unit 2 **(Lecture: 12)**
Cartesian product of sets, Equivalence relations, partition, partial and total order relation Functions, Composition of functions, Invertible functions, Cardinality of a set, Countable and Uncountable sets, Cantor's theorem,

Unit 3 **(Lecture: 12)**
Well-ordering property of positive integers, Division algorithm, Euclidean algorithm, Fundamental Theorem of Arithmetic, Modular arithmetic and basic properties of congruences, Principle of mathematical induction.

Unit 4 **(Lecture: 12)**
Matrices, Operation on Matrices, Kinds of matrices, Transpose, symmetric & skew symmetric Matrices, Hermitian, skew Hermitian Matrices, Adjoint and Inverse of a matrix, orthogonal matrix, Solution of a system of linear equations by matrix methods. Echelon forms, Rank of a matrix.

Unit 5 **(Lecture: 14)**

Fundamental theorem of algebra, Relation between roots and coefficients of a polynomial equation, Symmetric Function of roots, Transformation of equation, Descartes rule of signs, Solution of Cubic equation (Cardon's method) and bi quadratic equation (Euler's method).

References:

1. Dickson, Leonard Eugene (1922). *First Course in The Theory of Equations*. John Wiley & Sons, Inc. New York.
2. Kolman, Bernard, & Hill, David R. (2001). *Introductory Linear Algebra with Applications* (7th ed.). Pearson Education, Delhi. First Indian Reprint 2003.

Additional Readings:

1. Andrilli, Stephen, & Hecker, David (2016). *Elementary Linear Algebra* (5th ed.). Academic Press, Elsevier India Private Limited.
2. Burton, David M. (2007). *Elementary Number Theory* (7th ed.). Tata Mc-Graw Hill Edition, Indian Reprint.
3. K.K.Jha , Advanced Set Theory.Nav BharatPrakashan Patna
4. M.L.Khanna, Theory of Equations, Jai Prakash Nath& Co. Merrut (U.P.)
5. Lalji Prasad, Matrices, Paramount Publications Patna
6. Dasgupta , Trigonometry, Bharti Bhawan Patna.

MIC-01: Algebra (03 credits) (Lecture: 30)

Course Objectives: The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory and matrices to understand their linkage to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Employ De Moivre's theorem in a number of applications to solve numerical problems.
ii) Apply Euclid's algorithm and backwards substitution to find greatest common divisor.
iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

Course Contents:

Unit 1 **(Lecture: 08)**
Polar representation of complex numbers, De Moivre's theorem and its applications, Logarithms of complex quantities'Hyperbolic functions,Gregory series , Summation of series,.

Unit 2 **(Lecture: 07)**
Cartesian product of sets, Equivalence relations, Functions, Composition of functions, Invertible functions, Partial and Total order relation,Countable and Uncountable sets,

Unit 3 **(Lecture: 08)**
Matrices, Operation on Matrices, Kinds of matrices, Transpose, symmetric & skew symmetric matrices, Hermitian and skew Hermitian matrices , Adjoint and Inverse of a matrix, Solution of a system of linear equations by matrix methods.

Unit 4 **(Lecture: 07)**
Fundamental theorem of algebra, Relation between roots and coefficients of a polynomial equation, Evaluation of symmetric functions of roots , Transformation of equation, Solution of Cubic equation (Cardon's method).

References:

1. Dickson, Leonard Eugene (1922). *First Course in The Theory of Equations*. John Wiley & Sons, Inc. New York.
2. Lay, David C., Lay, Steven R., & McDonald, Judi J. (2016). *Linear Algebra and its Applications* (5th ed.). Pearson Education

Additional Readings:

1. Andrilli, Stephen, & Hecker, David (2016). *Elementary Linear Algebra* (5th ed.). Academic Press, Elsevier India Private Limited.

2. Burton, David M. (2007). *Elementary Number Theory* (7th ed.). Tata Mc-Graw Hill Edition, Indian Reprint.
3. K.K.Jha , Advanced Set Theory, Nav Bharat Publication, Patna
4. M.L.Khanna, Theory of Equations, Jai Prakash Nath& Co. Merrut (U.P.)
5. Lalji Prasad, Matrices, Paramount Publications Patna
6. Dasgupta , Trigonometry, Bharti Bhawan Patna

MATHEMATICS

Semester-II

MJC-02: Calculus & Geometry (06 credits) (Lecture: 60)

Course Objectives: The primary objective of this course is to introduce the basic tools of calculus and geometric properties of different conic sections which are helpful in understanding their applications in planetary motion, design of telescope and to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
ii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

Course Contents:

Unit 1 **(Lectures: 12)**
Successive differentiation and Leibnitz's theorem, Maclaurin 's and Taylor's series of Expansion, Tangent and Normal, Partial differentiation and Euler's theorem, Total Differential, L'Hospital's rule, , Curvature, Asymptotes, Curve tracing in Cartesian coordinates and polar coordinates of standard curves.

Unit 2 **(Lectures: 12)**
Integration of rational and irrational functions. Evaluation of definite integrals, Reduction formulae. Area, Length of plane curves and area bounded by plane curves. Volume and surface area of solid of revolution, Beta and Gamma Functions, Multiple Integrals.

Unit 3 **(Lectures: 10)**
Transformation of rectangular axes, General equations of conics and its reduction to the normal form, Equation of the tangent and normal at a point of the Conics.

Unit 4 **(Lectures: 12)**
Sphere, Cone, Cylinder, Central conicoid, Paraboloids, Plane section of conicoid, Generating lines, Tangent plane and normal to a conicoid.

Unit 5 **(Lectures: 14)**
Scalar triple product and vector triple product, Product of four vectors, Introduction to vector functions, Operations with vector-valued functions, Differentiation and integration of vector functions, Gradient of a scalar and Divergence and Curl of a vector function in Cartesian coordinate.

References:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). *Calculus* (10th ed.). John Wiley & Sons Singapore Pte. Ltd. Indian Reprint (2016) by Wiley India Pvt. Ltd. Delhi.
2. Osborne, George. A. (1906). *Differential and Integral Calculus with Examples and Applications*. Revised Edition. D. C. Health & Co. Publishers. Boston, U.S.A.
3. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). *Calculus* (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.

Additional Readings:

1. Thomas, Jr. George B., Weir, Maurice D., & Hass, Joel (2014). *Thomas' Calculus* (13th ed.). Pearson Education, Delhi. Indian Reprint 2017.
2. Lalji Prasad , Integral Calculus, Paramount Publications Patna
3. B.C. Das and B.N. Mukherjee, Differential calculus , Integral Calculus, Dhur & Sons Pvt.Ltd. Kolkatta
4. Shanti Narayan , P.K.Mittal , Integral Calculus, S. Chand, New Delhi
5. Utpal Chatterjee, Vector and Tensor Analysis , Academic Publishers ,Kolkatta
6. Dasgupta , Differential Calculus, Bharti Bhawan Patna

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MIC-02: Calculus & Geometry (03 credits) (Lecture: 30)

Course Objectives: The primary objective of this course is to introduce the basic tools of calculus and geometric properties of different conic sections which are helpful in understanding their applications in planetary motion, design of telescope and to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
ii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

Course Contents:

Unit 1 **(Lectures: 08)**
Successive differentiation and Leibnitz's theorem, Maclaurin's and Taylor's series of Expansion, Partial differentiation and Euler's theorem, Total Differential, L'Hospital's rule, Tangent and Normal, Asymptotes, Curvature.

Unit 2 **(Lectures: 08)**
Evaluation of definite integrals, Reduction formulae, Length of plane curve and area bounded by plane curves, Volumes and Surface area of solid revolution.

Unit 3 **(Lectures: 07)**
Transformation of rectangular axes, General equations of Conic and its Reduction to the normal form, Equation of the tangent and normal at a point of the Conic.

Unit 4 **(Lectures: 07)**
Sphere, Cone, Cylinder, Central conicoid, Paraboloids, Plane section of conicoid, Generating lines, Tangent plane and normal to a conicoid.

References:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). *Calculus* (10th ed.). John Wiley & Sons Singapore Pte. Ltd. Indian Reprint (2016) by Wiley India Pvt. Ltd. Delhi.
2. Osborne, George. A. (1906). *Differential and Integral Calculus with Examples and Applications*. Revised Edition. D. C. Health & Co. Publishers. Boston, U.S.A.
3. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). *Calculus* (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.
4. SL.Loney , Coordinate Geometry
5. Thomas, Jr. George B., Weir, Maurice D., & Hass, Joel (2014). *Thomas' Calculus* (13th ed.). Pearson Education, Delhi. Indian Reprint 2017.

Additional Readings:

1. Lalji Prasad , Integral Calculus, Paramount Publications Patna
2. Shanti Narayan , P.K.Mittal , Integral Calculus, S. Chand, New Delhi
3. B.C. Das and B.N. Mukherjee, Differential calculus, Dhur& Sons Pvt.Ltd. Kolkatta

4. A skwith, The Analytical Geometry of the conic sections.
5. S L Loney ,Coordinate Geometry
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4 Year Bachelor of Science/ Arts (MATHEMATICS) CBCS

List of Major Core Courses (MJC):

Sl. No.	Sem	Course Code	Name of the Course	Credits	Marks
1.	I	MJC-01	Algebra	6	100
2.	II	MJC-02	Calculus &Geometry	6	100
3.	III	MJC-03	Real Analysis	5	100
4.	III	MJC-04	Ordinary Differential Equations	4	100
5.	IV	MJC-05	Theory of Real Functions	5	100
6.	IV	MJC-06	Group Theory	5	100
7.	IV	MJC-07	Partial Differential Equations	5	100
8.	V	MJC-08	Ring Theory and Linear Algebra-I	5	100
9.	V	MJC-09	Multivariate Calculus	5	100
10.	VI	MJC-10	Complex Analysis	4	100
11.	VI	MJC-11	Metric Space	5	100
12.	VI	MJC-12	Riemann Integration and Series of Functions	5	100
13.	VII	MJC-13	Ring Theory and Linear Algebra-II	5	100
14.	VII	MJC-14	Research Methodology	5	100
15.	VII	MJC-15	Numerical Methods	6	100
16.	VIII	MJC-16	Mathematical Finance	4	100
Sub Total = 80					

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14/06/2023

4 Year Bachelor of Science/ Arts (MATHEMATICS) CBCS

List of Minor Core Courses (MIC):

Sl. No.	Sem.	Course Code	Name of the Course	Credits	Marks
1.	I	MIC-01	Algebra	3	100
2.	II	MIC-02	Calculus &Geometry	3	100
3.	III	MIC-03	Real Analysis	3	100
4.	IV	MIC-04	Ordinary Differential Equations	3	100
5.	V	MIC-05	Theory of Real Functions	3	100
6.	V	MIC-06	Group Theory	3	100
7.	VI	MIC-07	Partial Differential Equations	3	100
8.	VI	MIC-08	Ring Theory and Linear Algebra-I	3	100
9.	VII	MIC-09	Multivariate Calculus	4	100
10.	VIII	MIC-10	Complex Analysis	4	100
Sub Total = 32					

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14/6/23

14/06/2023

4-Years Bachelor of Science/Arts (MATHEMATICS)

CBCS Syllabus

Semester-I

MJC-01: Algebra (06 credits) (Lecture: 60)

Course Objectives: The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory and matrices to understand their linkage to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Employ De Moivre's theorem in a number of applications to solve numerical problems.
ii) Apply Euclid's algorithm and backwards substitution to find greatest common divisor.
iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

Course Contents:

Unit 1 **(Lecture: 10)**
Polar representation of complex numbers, De -Moivre's theorem and its applications, Logarithms of complex quantities, Hyperbolic functions, Gregory series, Summation of series, Resolution into factors.

Unit 2 **(Lecture: 12)**
Cartesian product of sets, Equivalence relations, partition, partial and total order relation Functions, Composition of functions, Invertible functions, Cardinality of a set, Countable and Uncountable sets, Cantor's theorem,

Unit 3 **(Lecture: 12)**
Well-ordering property of positive integers, Division algorithm, Euclidean algorithm, Fundamental Theorem of Arithmetic, Modular arithmetic and basic properties of congruences, Principle of mathematical induction.

Unit 4 **(Lecture: 12)**
Matrices, Operation on Matrices, Kinds of matrices, Transpose, symmetric & skew symmetric Matrices, Hermitian, skew Hermitian Matrices, Adjoint and Inverse of a matrix, orthogonal matrix, Solution of a system of linear equations by matrix methods. Echelon forms, Rank of a matrix.

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Unit 5 **(Lecture: 14)**

Fundamental theorem of algebra, Relation between roots and coefficients of a polynomial equation, Symmetric Function of roots, Transformation of equation, Descartes rule of signs, Solution of Cubic equation (Cardon's method) and bi quadratic equation (Euler's method).

References:

1. Dickson, Leonard Eugene (1922). *First Course in The Theory of Equations*. John Wiley & Sons, Inc. New York.
2. Kolman, Bernard, & Hill, David R. (2001). *Introductory Linear Algebra with Applications* (7th ed.). Pearson Education, Delhi. First Indian Reprint 2003.

Additional Readings:

1. Andrilli, Stephen, & Hecker, David (2016). *Elementary Linear Algebra* (5th ed.). Academic Press, Elsevier India Private Limited.
2. Burton, David M. (2007). *Elementary Number Theory* (7th ed.). Tata Mc-Graw Hill Edition, Indian Reprint.
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4. M.L.Khanna, Theory of Equations, Jai Prakash Nath& Co. Merrut (U.P.)
5. Lalji Prasad, Matrices, Paramount Publications Patna
6. Dasgupta , Trigonometry, Bharti Bhawan Patna.

MIC-01: Algebra (03 credits) (Lecture: 30)

Course Objectives: The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory and matrices to understand their linkage to the real-world problems.

Course Learning Outcomes: This course will enable the students to:

i) Employ De Moivre's theorem in a number of applications to solve numerical problems.

ii) Apply Euclid's algorithm and backwards substitution to find greatest common divisor.

iii) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

Course Contents:

Unit 1 **(Lecture: 08)**

Polar representation of complex numbers, De Moivre's theorem and its applications, Logarithms of complex quantities'Hyperbolic functions,Gregory series , Summation of series,.

Unit 2 **(Lecture: 07)**

Cartesian product of sets, Equivalence relations, Functions, Composition of functions, Invertible functions, Partial and Total order relation,Countable and Uncountable sets,

Unit 3 **(Lecture: 08)**

Matrices, Operation on Matrices, Kinds of matrices, Transpose, symmetric & skew symmetric matrices, Hermitian and skew Hermitian matrices , Adjoint and Inverse of a matrix, Solution of a system of linear equations by matrix methods.

Unit 4 **(Lecture: 07)**

Fundamental theorem of algebra, Relation between roots and coefficients of a polynomial equation, Evaluation of symmetric functions of roots , Transformation of equation, Solution of Cubic equation (Cardon's method).

References:

1. Dickson, Leonard Eugene (1922). *First Course in The Theory of Equations*. John Wiley & Sons, Inc. New York.
2. Lay, David C., Lay, Steven R., & McDonald, Judi J. (2016). *Linear Algebra and its Applications* (5th ed.). Pearson Education

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1. Andrilli, Stephen, & Hecker, David (2016). *Elementary Linear Algebra* (5th ed.). Academic Press, Elsevier India Private Limited.

2. Burton, David M. (2007). *Elementary Number Theory* (7th ed.). Tata Mc-Graw Hill Edition, Indian Reprint.
3. K.K.Jha , Advanced Set Theory, Nav Bharat Publication, Patna
4. M.L.Khanna, Theory of Equations, Jai Prakash Nath& Co. Merrut (U.P.)
5. Lalji Prasad, Matrices, Paramount Publications Patna
6. Dasgupta , Trigonometry, Bharti Bhawan Patna

MATHEMATICS

Semester-II

MJC-02: Calculus & Geometry (06 credits) (Lecture: 60)

Course Objectives: The primary objective of this course is to introduce the basic tools of calculus and geometric properties of different conic sections which are helpful in understanding their applications in planetary motion, design of telescope and to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
ii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

Course Contents:

Unit 1 **(Lectures: 12)**
Successive differentiation and Leibnitz's theorem, Maclaurin 's and Taylor's series of Expansion, Tangent and Normal, Partial differentiation and Euler's theorem, Total Differential, L'Hospital's rule, , Curvature, Asymptotes, Curve tracing in Cartesian coordinates and polar coordinates of standard curves.

Unit 2 **(Lectures: 12)**
Integration of rational and irrational functions. Evaluation of definite integrals, Reduction formulae. Area, Length of plane curves and area bounded by plane curves. Volume and surface area of solid of revolution, Beta and Gamma Functions, Multiple Integrals.

Unit 3 **(Lectures: 10)**
Transformation of rectangular axes, General equations of conics and its reduction to the normal form, Equation of the tangent and normal at a point of the Conics.

Unit 4 **(Lectures: 12)**
Sphere, Cone, Cylinder, Central conicoid, Paraboloids, Plane section of conicoid, Generating lines, Tangent plane and normal to a conicoid.

Unit 5 **(Lectures: 14)**
Scalar triple product and vector triple product, Product of four vectors, Introduction to vector functions, Operations with vector-valued functions, Differentiation and integration of vector functions, Gradient of a scalar and Divergence and Curl of a vector function in Cartesian coordinate.

References:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). *Calculus* (10th ed.). John Wiley & Sons Singapore Pte. Ltd. Indian Reprint (2016) by Wiley India Pvt. Ltd. Delhi.
2. Osborne, George. A. (1906). *Differential and Integral Calculus with Examples and Applications*. Revised Edition. D. C. Health & Co. Publishers. Boston, U.S.A.
3. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). *Calculus* (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.

Additional Readings:

1. Thomas, Jr. George B., Weir, Maurice D., & Hass, Joel (2014). *Thomas' Calculus* (13th ed.). Pearson Education, Delhi. Indian Reprint 2017.
2. Lalji Prasad , Integral Calculus, Paramount Publications Patna
3. B.C. Das and B.N. Mukherjee, Differential calculus , Integral Calculus, Dhur & Sons Pvt.Ltd. Kolkatta
4. Shanti Narayan , P.K.Mittal , Integral Calculus, S. Chand, New Delhi
5. Utpal Chatterjee, Vector and Tensor Analysis , Academic Publishers ,Kolkatta
6. Dasgupta , Differential Calculus, Bharti Bhawan Patna

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MIC-02: Calculus & Geometry (03 credits) (Lecture: 30)

Course Objectives: The primary objective of this course is to introduce the basic tools of calculus and geometric properties of different conic sections which are helpful in understanding their applications in planetary motion, design of telescope and to the real-world problems.

Course Learning Outcomes: This course will enable the students to:
i) Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
ii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

Course Contents:

Unit 1 **(Lectures: 08)**
Successive differentiation and Leibnitz's theorem, Maclaurin's and Taylor's series of Expansion, Partial differentiation and Euler's theorem, Total Differential, L'Hospital's rule, Tangent and Normal, Asymptotes, Curvature.

Unit 2 **(Lectures: 08)**
Evaluation of definite integrals, Reduction formulae, Length of plane curve and area bounded by plane curves, Volumes and Surface area of solid revolution.

Unit 3 **(Lectures: 07)**
Transformation of rectangular axes, General equations of Conic and its Reduction to the normal form, Equation of the tangent and normal at a point of the Conic.

Unit 4 **(Lectures: 07)**
Sphere, Cone, Cylinder, Central conicoid, Paraboloids, Plane section of conicoid, Generating lines, Tangent plane and normal to a conicoid.

References:

1. Anton, Howard, Bivens, Irl, & Davis, Stephen (2013). *Calculus* (10th ed.). John Wiley & Sons Singapore Pte. Ltd. Indian Reprint (2016) by Wiley India Pvt. Ltd. Delhi.
2. Osborne, George. A. (1906). *Differential and Integral Calculus with Examples and Applications*. Revised Edition. D. C. Health & Co. Publishers. Boston, U.S.A.
3. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). *Calculus* (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.
4. SL.Loney , Coordinate Geometry
5. Thomas, Jr. George B., Weir, Maurice D., & Hass, Joel (2014). *Thomas' Calculus* (13th ed.). Pearson Education, Delhi. Indian Reprint 2017.

Additional Readings:

1. Lalji Prasad , Integral Calculus, Paramount Publications Patna
2. Shanti Narayan , P.K.Mittal , Integral Calculus, S. Chand, New Delhi
3. B.C. Das and B.N. Mukherjee, Differential calculus, Dhur& Sons Pvt.Ltd. Kolkatta

4. A skwith, The Analytical Geometry of the conic sections.
5. S L Loney ,Coordinate Geometry
6. Dasgupta, Differential calculus, Bharti Bhawan Patna

14/06/2023

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4 Year Bachelor of Science/ Arts (MATHEMATICS) CBCS

List of Major Core Courses (MJC):

Sl. No.	Sem	Course Code	Name of the Course	Credits	Marks
1.	I	MJC-01	Algebra	6	100
2.	II	MJC-02	Calculus &Geometry	6	100
3.	III	MJC-03	Real Analysis	5	100
4.	III	MJC-04	Ordinary Differential Equations	4	100
5.	IV	MJC-05	Theory of Real Functions	5	100
6.	IV	MJC-06	Group Theory	5	100
7.	IV	MJC-07	Partial Differential Equations	5	100
8.	V	MJC-08	Ring Theory and Linear Algebra-I	5	100
9.	V	MJC-09	Multivariate Calculus	5	100
10.	VI	MJC-10	Complex Analysis	4	100
11.	VI	MJC-11	Metric Space	5	100
12.	VI	MJC-12	Riemann Integration and Series of Functions	5	100
13.	VII	MJC-13	Ring Theory and Linear Algebra-II	5	100
14.	VII	MJC-14	Research Methodology	5	100
15.	VII	MJC-15	Numerical Methods	6	100
16.	VIII	MJC-16	Mathematical Finance	4	100
Sub Total = 80					

G Das Singh 14/06/23

14/6/23

14/06/2023

4 Year Bachelor of Science/ Arts (MATHEMATICS) CBCS

List of Minor Core Courses (MIC):

Sl. No.	Sem.	Course Code	Name of the Course	Credits	Marks
1.	I	MIC-01	Algebra	3	100
2.	II	MIC-02	Calculus &Geometry	3	100
3.	III	MIC-03	Real Analysis	3	100
4.	IV	MIC-04	Ordinary Differential Equations	3	100
5.	V	MIC-05	Theory of Real Functions	3	100
6.	V	MIC-06	Group Theory	3	100
7.	VI	MIC-07	Partial Differential Equations	3	100
8.	VI	MIC-08	Ring Theory and Linear Algebra-I	3	100
9.	VII	MIC-09	Multivariate Calculus	4	100
10.	VIII	MIC-10	Complex Analysis	4	100
Sub Total = 32					

Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System

Skill Enhancement Course (SEC)

Semester – I (SEC- 1)

Science	Social Science/Arts	Commerce
• Advance Spreadsheet Tools • Basic IT Tolls • Creative Writing • Communication in Everyday life	• Advance Spreadsheet Tools • Public Speaking in English Language & Leadership • Creative Writing • Communication in Everyday life	• Advance Spreadsheet Tools • Digital Marketing • Creative Writing • Communication in Everyday life

Semester – II (SEC- 2)

Science	Social Science/Arts	Commerce
• Big Data Analysis • Beginners Course to Calligraphy • Introduction to Cloud Computing (AWS) • Personality Development & Communication	• Big Data Analysis • Beginners Course to Calligraphy • Personality Development & Communication • पटकथा लेखन	• Big Data Analysis • Beginners Course to Calligraphy • Business Communication • Personality Development & Communication

Semester – III (SEC- 3)

Science	Social Science/Arts	Commerce
• Prospecting E-waste for sustainability • Visual Communication & Photography • Graphic Design & Animation • Statistical Software Package • Communication in Professional Life	• Personal Financial Planning • Visual Communication & Photography • Statistical Software Package • Communication in Professional Life • रचानात्मक लेखन • रंगमंच	• Prospecting E-waste for sustainability • Sustainable Ecotourism & Entrepreneurship • Visual Communication & Photography • Statistical Software Package • Communication in Professional Life

LIST OF SKILL ENHANCEMENT COURSES (SEC)

SL. NO.	Course Title	LTP Distribution of the Course			Total Credits:	Total Marks = 100
		L	T	P		
1	Advance Spreadsheet Tools	1	0	3	3	End -Term Appraisal : 70 Marks Internal Assessment: 30 Marks
2	Basic IT Tolls	1	0	3	3	
3	Beginners Course to Calligraphy	1	0	3	3	
4	Big Data Analysis	1	0	3	3	
5	Business Communication	1	0	3	3	
6	Communication in Everyday life	1	0	3	3	
7	Communication in Professional Life	1	0	3	3	
8	Creative Writing	1	0	3	3	
9	Digital Marketing	1	0	3	3	
10	Graphic Design & Animation	1	0	3	3	
11	Introduction to Cloud Computing (AWS)	1	0	3	3	
12	Personal Financial Planning	1	0	3	3	
13	Personality Development & Communication	1	0	3	3	
14	Prospecting E-waste for sustainability	1	0	3	3	
15	Public Speaking in English Language & Leadership	1	0	3	3	
16	Statistical Software Package	1	0	3	3	
17	Sustainable Ecotourism & Entrepreneurship	1	0	3	3	
18	Visual Communication & Photography	1	0	3	3	
19	पटकथा लेखन	1	0	3	3	
20	रंगमंच	1	0	3	3	
21	रचानात्मक लेखन	1	0	3	3	

Skill Enhancement Course (SEC)

- ***Course Title - Advance Spreadsheet Tools***

Learning Objectives

The Learning Objectives of this course are as follows:

- To enable the students to use Excel for advanced data analysis
- To equip the students to with automation skills on excel
- To enable the students to use excel for informed decision making.

Learning outcomes

The Learning Outcomes of this course are as follows:

- By studying this course, students will be able to make meaningful representations of data in the form of charts and pivot tables.
- By studying this course, students will be able to draw analysis on data using spreadsheets and use interpretation to make decisions.
- By studying this course, students will be able to generate word documents with appropriate formatting, layout, proofing.
- By studying this course, students will be able to manage data for generating queries, forms and reports in a database.

SYLLABUS

Unit 1: Excel Advanced Techniques

Templates, Efficiency, and Risk (Standard Deviation, Variance, and Coefficient of Variation), Data Validation; *Functions and Power functions, Array Formulae (Frequency Distribution, mode.mult, mode.sngl), Tables, Advanced Range Names, What-if-analysis: Goal-seek, Data tables, and Scenario Manager; Data analysis ToolPak: Descriptive Statistics, Moving averages, Histogram, Covariance, correlation, and Regression analysis (only for projection); solver add in. Problem Solving using Solver (optimal product mix, workforce scheduling, transportation, capital budgeting, financial planning), Integrating excel with other tools: MS word, outlook, PowerPoint, Access, Power BI.

Unit 2: Excel Interactivity and Automation

Index and Match, Offset, Dynamic Charting, Database functions, Text functions, and Error functions: IfError, IsError, Aggregate, Circular Reference, Formula Auditing, Floating-Point Errors, Form Controls (Button, Combo, Check box, Spinner, List, Option), Visual Basic (only basic). Recording Macros, Absolute and relative macros, editing macros, Use of spinner buttons and command buttons; Sub Procedure, Function Procedure (creating New Functions); Working with Loops: Do_while loop, For_Next loop; Creating User Forms: Message Box, Input Box; If_Then_Else.

Unit 3: Introduction to VBA

Conditional Formatting, Charts that Inspire (Waterfall, Column, Line, Combo, Thermometer, Scatter, Histogram) Sheers, Sparklines, Graphics Tricks and Techniques, Worksheet Automation using Macros: Absolute and relative macros, editing macros, Creating new functions using macros, Use of spinner buttons and command buttons.

Unit 4: Data Analysis and Decision-Making

Working with External Data, Advanced Uses of PivotTables, PowerPivot, Reporting with PowerPivot, Power query, Dashboard, Creating a spreadsheet in the area of: Loan and Lease statement; Ratio Analysis; Payroll Accounting; Capital Budgeting (NPV & IRR), Portfolio Management, Breakeven analysis, and Sensitivity analysis; Operations Management: Constraint, Forecasting & Trend Analysis optimization, Assignment Problems; Depreciation Accounting (Single Method); Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression Analysis

Essential/recommended readings

- Excel 2016 Power Programming with VBA, Michael Alexander, Dick Kusleika, Wiley.
- Financial Analysis and Modelling Using Excel and VBA, Chandan Sengupta, Second Edition, Wiley Student Edition.
- MS Excel 2016, Data Analysis & Business Modelling, Wayne Winston, PHI.

Suggestive readings

- Microsoft Excel 2016 - Data Analysis and Business Modelling Paperback - 1 May
- 2017 Wayne L. Winston, Microsoft Press.
- Microsoft Excel Practical Formulae: From Basic Data Analysis to Advanced
- Formulae
- Manipulation Diane Griffiths.

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- ***Course Title – Basic IT Tools***

Learning Objectives

The Learning Objectives of this course are as follows:

- To enable students develop IT skills that are a pre-requisite in today's work environment.
- To equip them with basic computing skills that will enhance their employability in general.
- To enable the student to analyse and present information in a meaningful manner.

Learning outcomes

The Learning Outcomes of this course are as follows:

- By studying this course, students will be able to use word-processor to generate
- documents with appropriate formatting, layout, review and referencing.
- By studying this course, students will be able to manage data in worksheets and
- workbooks and analyze it using spreadsheet functions and inbuilt formulas.
- By studying this course, students will be able to draw analysis on data using
- spreadsheets to make decisions.
- By studying this course, students will be able to make meaningful representations of
- data in the form of charts and pivot tables.
- By studying this course, students will be able to manage data in database tables and use
- the same for generating queries, forms and reports.

SYLLABUS

Course Contents:

Unit 1: Introduction to Spreadsheets

Spreadsheets: Concept of worksheets and workbooks, creating, opening, closing and saving workbooks, moving, copying, inserting, deleting and renaming worksheets, working with multiple worksheets and multiple workbooks, controlling worksheet views, naming cells using name box, name create and name define; Exchanging data using clipboard, object linking and embedding; Printing and Protecting worksheets: Adjusting margins, creating headers and footers, setting page breaks, changing orientation, creating portable documents and printing data and formulae; Implementing file level security and protecting data within the worksheet; Understanding absolute, relative and mixed referencing in formulas, referencing cells in other worksheets and workbooks, correcting common formula errors, working with inbuilt function categories like mathematical, statistical, text, lookup, information, logical, database, date and time and basic financial functions.

Unit 2: Data Analysis in Spreadsheets

Consolidating worksheets and workbooks using formulae and data consolidate command; Choosing a chart type, understanding data points and data series, editing and formatting chart elements, and creating sparkline graphics, Analysing data using pivot tables: Creating, formatting and modifying a pivot table, sorting, filtering and grouping items, creating calculated field and calculated item, creating pivot table charts, producing a report with pivot tables. Introduction to recording and execution of macros.

Unit 3: Word Processing

Introduction: Creating and saving your document, displaying different views, working with styles and character formatting, working with paragraph formatting techniques using indents, tabs, alignment, spacing, bullets and numbering and creating borders; Page setup and sections: Setting page margins, orientation, headers and footers, end notes and foot notes, creating section breaks and page borders; Working with tables: Creating tables, modifying table layout and design, sorting, inserting graphics in a table, table math, converting text to table and vice versa; Create newspaper columns, indexes and table of contents, Spell check your document using inbuilt and custom dictionaries, checking grammar and style , using thesaurus and finding and replacing text; Create bookmarks, captions and cross referencing, adding hyperlinks, adding sources and compiling and bibliography; Mail merge: Creating and editing your main document and data source, sorting and filtering merged documents and using merge instructions like ask, fill-in and if-then-else; Linking and embedding to keep things together.

Unit 4: Databases

Introduction to Database Development: Database Terminology, Objects, Creating Tables, working with fields, understanding Data types, Changing table design, Assigning Field Properties, Setting Primary Keys, using field validation and record validation rules, Indexing, working with multiple tables, Relationships & Integrity Rules, Join Properties, Record manipulation, Sorting & Filtering; Select data with queries: Creating Query by design & by wizard (Select, Make Table, Append, Delete, Cross Tab, Update, Parameterized Query, Find Duplicate and Find Unmatched), Creating multi table queries, creating & working with table joins. Using operators & expressions: Creating simple & advance criteria; Working with forms: Creating Basic forms, working with bound, unbound and calculated controls, understanding property sheet, Working with Data on Forms: Changing Layout, creating Sub Forms, creating list box, combo box and option groups; Working with Reports: Creating Basic Reports, Creating Header & Footer, Placing Controls on reports, sorting & grouping, Creating Sub reports.

Essential/recommended readings

- Swinford, E., Dodge, M., Couch, A., Melton, B. A. (2013). Microsoft Office Professional 2013. United States: O'Reilly Media.
- Wang, W. (2018). Office 2019 For Dummies. United States: Wiley. Microsoft
  Lambert, J. (2019). Microsoft Word 2019 Step by Step. United States: Pearson Education.

Suggestive readings

- Jelen, B. (2013). Excel 2013 Charts and Graphs. United Kingdom: Que.
- Alexander, M., Jelen, B. (2013). Excel 2013 Pivot Table Data Crunching. United Kingdom: Pearson Education.
- Alexander, M., Kusleika, R. (2018). Access 2019 Bible. United Kingdom: Wiley.

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- ***Course Title*** **– Beginners Course to Calligraphy**

Learning Objectives

The Learning Objectives of this course are as follows:

- To teach students the art of Calligraphy.
- To make students better at handwriting and embellish the scripts.
- To help the students communicate with creativity.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Students will be skilled in calligraphy scripts.
- Learning flourishing will help to develop good writing.
- Practice sessions will further a project at the end of semester.
- Will induce skills to set up a business, too.

SYLLABUS

Unit 1: Introduction to Calligraphy

- Definition, History of calligraphy, Calligraphy at the Global level, Types of Calligraphy:Classical Calligraphy & Modern Calligraphy
- Practice Sessions: Introducing students to Calligraphy and its types through images,videos and animations.

Unit 2: Introduction to the Writing tools

- Tool Kit, Different Types of Pens, Different Types of Nibs, Different Types of Brushes, Different Types of Inks
- Practice Sessions: Display of Writing items, Discussion on the usage of different types of pens, nibs and brushes through hands-on activities

Unit 3: Foundation to Calligraphy

- How to write letters?, Majuscules, Miniscules, Numbers, Learning Strokes, Sans SerifB- point, Celtic, Italian Script, Roman Script, Gothic Script
- Practice Sessions: Learning and practicing strokes- Upstroke, Downstroke, Overturn, Underturn, Compound curve, Oval, Ascending loop
- Hands-on activities and Assessment on Sans Serif B-point, Celtic, Italian Script,Roman Script, Gothic Script, Flourishing

Essential/recommended readings

- Suepsuan, P. A. (2021). Start Calligraphy The Right way to write: Learn Calligraphy The Complete Book - Modern Calligraphy Pen For Beginners, Learning Resources Step By Step Number Line, Mastering Modern Calligraphy. Independently published.
- C., & Co., T. P. (2020). Modern Calligraphy Set for Beginners: A Creative Craft Kit for Adults featuring Hand Lettering 101 Book, Brush Pens, Calligraphy Pens, and More. Paige Tate & Co.

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• Course Title – Big Data Analytics

Learning Objectives

The Learning Objectives of this course are as follows:

- To Understand the Big Data Platform and its Uses
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS.
- Provide hands on Hadoop Eco System
- To understand spark framework

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to identify Big Data and its Business Implications.
- After studying this course, students will be able to list the components of Hadoop and Hadoop Eco-System.
- After studying this course, students will be able to access and process data on distributed file system,
- After studying this course, students will be able to manage job execution in Hadoop environment.
- After studying this course, students will be able to develop Big Data Solutions using Hadoop Eco System.

SYLLABUS

Unit 1: Fundamentals of Big Data Analysis

Data Storage and Analysis, Characteristics of Big Data, Big Data Analytics, Typical Analytical Architecture, Requirement for new analytical architecture, Challenges in Big Data Analytics - Need of big data frameworks

Unit 2: Hadoop Framework

Hadoop, Requirement of Hadoop Framework, Design principle of Hadoop -Comparison with other system, Hadoop Components - Hadoop 1 vs Hadoop 2, Hadoop Daemon's - HDFSCommands, Map Reduce Programming: I/O formats, Map side join, Reduce Side Join, Secondary sorting, Pipelining Map Reduce jobs

Unit 3: HDFS (Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

Unit 4: Spark Framework and Data Analysis with Spark Shell

Introduction to GPU Computing, CUDA Programming Model, CUDA API, Simple Matrix, Multiplication in CUDA, CUDA Memory Model, Shared Memory Matrix Multiplication, Additional CUDA API Features. Writing Spark Application - Spark Programming in Scala, Python, R, Java - Application Execution.

Practical Exercises

- Downloading and installing Hadoop.
- Understanding different Hadoop modes. Startup scripts, Configuration files.
- Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files.
- Run a basic word count Map reduce program to understand map reduce paradigm: To count words in a given file, to view the output file, and to calculate the execution time.
- Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
- Implement of Matrix Multiplication with Hadoop Map Reduce.
- Implementation of K-means clustering using Map Reduce.
- To study and implement basic functions and commands in R programming.
- To build Word cloud, a text mining method using R for easy to understand and visualization than a table data.
- To implement clustering program using R programming

Essential/recommended readings

- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
- Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.
- Tom White,"Hadoop:TheDefinitiveGuide",O'Reilly,4thEdition,2015.
- Nick Pentreath, Machine Learning with Spark, PacktPublishing,2015.
- Mohammed Guller, Big Data Analytics with Spark, Apress,2015.
- Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012

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- *Course Title* – **Business Communication**

Learning Objectives

The Learning Objectives of this course are as follows:

- To train students to enhance written as well as oral communication in the corporate world.
- To help students in understanding the principles and techniques of business communication.
- To understand the use of electronic media for communication.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to explain the need for communication in management.
- After studying this course, students will be able to appreciate the need of effective writing for communication.
- After studying this course, students will be able to demonstrate the skill of effective report writing and summarizing annual reports.
- After studying this course, students will be able to analyse business correspondence and e-correspondence.
- After studying this course, students will be able to appreciate oral presentations.

SYLLABUS

Unit 1: Introduction to the essentials of Business Communication
Meaning, process and functions. Need and importance. Medium: verbal & non-verbal communication. Channels: formal & informal. Levels of communication. Direction of communication: downward, upward, lateral, & diagonal. Effective communication: difficulties/barriers and solutions. Interactive and non-interactive techniques of communication. Listening as a tool of communication, Guidelines for effective listening.

Unit 2: Effective Writing
Guidelines for clear writing. References, bibliographical research tools. Citing methods, footnotes, discussion footnotes. Use of library and internet for collection, classification and interpretation of data and information.

Unit 3: Report Writing
Types of reports. Formal report: components and purpose. Organising information: outlining & numbering sections, section headings, sub-headings, & presentation. Writing reports on field work/visits to industries, business concerns. Summarising annual reports of companies: purpose, structure and principles. Drafting minutes.

Unit 4: Business Correspondence and E-Correspondence
Need and importance of business letters. Office memorandum, office circulars, notices and orders. Technology for communication. Effective IT communication tools. Electronic mail: advantages, safety and smartness in email. E-mail etiquettes.

Unit 5: Spoken English and Oral Presentation
Effective negotiation: elements, process and general guidelines. Telephonic conversation. Conducting & facing interviews. Conducting & participating in group decisions. Making presentations: content and organising. Features of a good presentation. Delivering a presentation.

Practical Exercises:

The learners are required to:

- learn how to summarise annual reports of companies.
- prepare presentations using power-point.
- participate in Group discussions and mock interviews.
- smartly draft business emails.

Essential/recommended readings

- C.B.Gupta (2019). Essentials of Business Communication, Sultan Chand & Sons.
- Kaul, A. Effective Business Communication, 2nd ed. PHI learning
- Lesikar, R.V. & Flatley, M.E. (2001). Basic Business Communication Skills for Empowering the Internet Generation, Tata McGraw Hill Publishing Company Ltd. New Delhi.
- Ludlow, R. & Panton, F.(1992). The Essence of Effective Communications, Prentice Hall of India Pvt. Ltd., New Delhi.
- Meyer C,Dev(2021). Communicating for Results,Oxford University Press
- Quintanilla, Kelly M, (2021), Business and Professional Communication, 4e, Sage Textbook
- R. C. Bhatia (2008), Business Communication, Ane Books Pvt Ltd, New Delhi.
- Raman and Singh(2012). Business Communication. Oxford University Press
- Scot, O., Contemporary Business Communication. Biztantra, New Delhi.

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- ***Course Title*** **– Communication in Everyday Life**

Learning Objectives

The Learning Objectives of this course are as follows:

- To lay down a basic foundation for basic communication that is a part of a student'severyday life.
- To inculcate the fundamentals of communication with the aim to enhance listening,speaking and writing skills.
- To hone practical skills that can be used in day-to-day affairs.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to improve mediation skills.
- After studying this course, students will be able to building human relationships.
- After studying this course, students will be able to foster societal understanding
- &develop an independent perspective.
- After studying this course, students will be able to enhance social Communication skills of students.

SYLLABUS

UNIT 1
Theory of Communication

- Meaning, Features, Uses, Cycle, Feedback, Advantages
- Barriers
- 7 C's of Communication

UNIT 2
Listening Skills

- Netiquettes
- Audio-book Listening & Discussions
- Note-taking

UNIT 3
Speaking Skills

- Oral Presentation- Audio-Visual aids, Audience & Feedback, Delivery ofPresentation, Handling Questions
- Group Discussion- Culture & History, Current Affairs, Society-related
- Public Speaking- Public Speech, Extempore
- Interview- Personal, Conversational, Public

UNIT 4
Reading Skills

- Close Reading
- Skimming
- Scanning

UNIT 5
Writing Skills

- Summarising
- Paraphrasing
- Note-making
- Essays- Expository Essay, Descriptive Essay, Narrative Essay
- Letter Writing- Formal Letter, Informal Letter

- Reports- Incidence, Newspaper, Organisational Report
- Analysis & Interpretation- Textual
- Intra & Inter-personal Skills - Monologue, Dialogue

Suggested Readings

- Chaudhary, Shoma. "Understanding Interviews, Billy Elliot is my Story, Only LessHappy". Tehelka: The People's Paper, 18 February 2006.
- Kumar, Dinesh. "Understanding Values, Our Muddled Generation". The Hindu, 26March 2006.
- Learning to Write I, "Free Writing". In Fluency in English II, ed. Varma, Pramodiniand Mukti Sanyal, pp. 1-5, Oxford, New Delhi, 2015.
- Learning to Write II, "Editing". In Fluency in English II, ed. Varma, Pramodini andMukti Sanyal, pp. 25-27, Oxford, New Delhi, 2015.
- Learning to Write III, "What makes Good Writing Good". In Fluency in English II, ed. Varma, Pramodini and Mukti Sanyal, pp. 48-51, Oxford, New Delhi, 2015.

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Course Title – Communication in Professional Life

Learning Objectives

The Learning Objectives of this course are as follows:

- To prepare the students for their upcoming professional fields.
- To inculcate the fundamentals of professional and business communication.
- To learn aspects of global communication.
- To enhance employability skills of the learners by enabling them to write effective resumes and face interviews with confidence

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to improve presentation skills to be learnt by effective use of verbal and non-verbal communication for the professional field.
- After studying this course, students will be able to acquire practical employability skills to be disseminated through focused sessions on practical employable knowledge.
- After studying this course, students will be able to enhance professional communication.
- After studying this course, students will be able to improve persuasion and negotiation skills which will be useful for the professional field.

UNIT 1

- Theory of Business Communication
- Introduction
- What is Business Communication?
- Language of Business Communication
- Cultural Components - Cross-Cultural Communication, Cultural Shock, Stereotyping, Ethnocentrism
- Miscommunication & Effective Communication

UNIT 2
Listening Skills

- Netiquettes
- Audio-book Listening & Discussions
- Note-taking

UNIT 3
Speaking Skills

- Presentation Skills- Oral Presentation, Ppt. Preparation, Ppt. Presentation
- Group Discussion
- Talks- Domain-specific, Ted-Talks, Business Meets, Motivational Talks
- Telephonic Skills
- Persuasion Skills
- Meeting & Negotiation
- Interview- Promotion Interview, Job Interview, Business Interview
- Functions and activities of PR

UNIT 4

Writing Skills

- Summarising & Paraphrasing
- Job-Oriented Skills- CV, Resume & Bio- Data, Job Application Letter
- Documentation
- Advertisements & Invitation
- Letter Writing- Applications, Business Letters
- Report- Analytical Report, Project Report
- Digital Communication in Social Space- Social Media Posts (Twitter, Facebook), Blog Writing, Review Writing
- Advertisement/Invitation/Poster Designing- Canva/MS Word/Coral
- Memo, Office Order, Minutes
- Making Online Academic/Work Profile- LinkedIn

Suggested Readings

- Kaushik, J.C. and K.K. Sinha eds., English for Students of Commerce, OxfordUniversity Press, New Delhi.
- Sethi, Anjana & Bhavana Adhikari, Business Communication, Tata McGraw Hill.
- Anjana Neira Dev, et.al, eds. Business English, Department of English,

  Universityof Delhi, 2011, Pearson Publications, New Delhi.

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Course Title – Communication in Professional Life

Learning Objectives

The Learning Objectives of this course are as follows:

- To build creative writing skills of students in the main inodes of creative writing vizpoetry, fiction (novel, short stories), non-fiction (life narratives, autobiographies andbiographies) and drama.
- To inculcate practical skills in students by mapping their creative talent which bebeneficial for employability too.
- To perform hands-on-activities to students to develop their creative skills throughpractical sessions.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to be sensitive to the texture ofliterary language.
- After studying this course, students will be able to develop craft in creative writing.
- After studying this course, students will be able to develop sense of expressingthemselves through poetry/short story/biography.
- After studying this course, students will be able to induce an understanding of therelationship between an individual and society.
- After studying this course, students will be able to get into different fields andpursue versatile career opportunities.
- After studying this course, students will be able to develop an understanding of theatre and performance through drama will also help them to develop observatoryand behavioural skills.
- After studying this course, students will be able to develop a critical thought processand a knack in putting it in words. Students may also utilise the learnings of proofreading and editing for their academic and professional growth.
- After studying this course, students will be able to go for publishing their own work.
- After studying this course, students will be able to write a book and submit.

SYLLABUS

UNIT 1

- Introduction to Creative Writing- Meaning, Importance
- Imagination & Writing- Peer-interaction, Activities on Imagination
- Tropes, Motifs and Figures- Learning tropes, motifs and figures through videos, Discussion on the findings
- Craft of Writing- Figure of Speech, Word Play, Character Creation
- Character Creation- Dialogue Enaction, Learning Characters through discussion on famous writings, Character Analysis, Writing activities on creating different types ofcharacters (gender/social background/ethnicity etc.)

UNIT 2

- Close Reading
- Analysis and Interpretation- Reading different works in Literature, Discussionin small groups, Practice Writing Session
- Proofreading & Editing- Practice sessions on Proofreading & Editing of different types of writing

UNIT 3

- Steps of Creative Writing- Pre-Writing, Writing, Post-Writing/Final Draft
- Types of Creative Writing- Poetry, Fiction, Non-Fiction (Life Narratives), Drama
- Creative Writing & Media- Film Review, Book Review, Other Writings in Media, Submission, Publication
- Learning to write Poetry- Reading & understanding Poetry; Practising tone, rhyme, metre, verses; Writing sessions
- Learning to write Fiction- Reading & understanding Fiction; Practicing different elements of fiction (Short story, Novella, Novel); Writing sessions
- Learning to write Non-Fiction- Reading & understanding Non-Fiction (Biographies & Autobiographies); Practicing different elements of non-fiction; Writing sessions
- Learning to write Drama- Reading & understanding Drama; Practicing different elements (plot, character, climax, verbal & non-verbal cues) of Drama; Writing sessions
- Submission & Publication (in Print & Digital) - Discussions over how & where to submit and publish (online/offline), Hands-on activities

Suggested Readings

- *Creative Writing: A Beginners ' Manual* by AnjanaNeira Dev et al. for The Departmentof English, University of Delhi (New Delhi: Pearson, 2008).

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Course Title – Digital Marketing

Learning Objectives

The Learning Objectives of this course are as follows:

- To acquaint the students with the knowledge of growing integration between the traditional and digital marketing concepts and practices in the digital era.
- To familiarize the students with the tools and techniques used by the digital marketers for driving the marketing decisions to attain marketing objectives.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the concept of digital marketing and its integration with traditional marketing.
- After studying this course, students will be able to understand customer value journey in digital context and behaviour of online consumers.
- After studying this course, students will be able to understand email, content and social media marketing and apply the learnings to create digital media campaigns.
- After studying this course, students will be able to examine various tactics for enhancing a website's position and ranking with search engines.
- After studying this course, students will be able to leverage the digital strategies to gain competitive advantage for business and career.

SYLLABUS

Unit 1: Marketing in the Digital World

Digital marketing: Concept, Features, Difference between traditional and digital marketing, Moving from traditional to digital Marketing; c

Digital Marketing Channels: Intent Based- SEO, Search Advertising; Brand Based-Display Advertising; Community Based-Social Media Marketing; Others-Affiliate, Email, Content, Mobile.

Customer Value Journey: 5As Framework; The Ozone 03 Concept Key; Traits of online consumer

Unit 2: Content and Email Marketing

Content Marketing: Step-by-step Content Marketing Developing a content marketing strategy Email Marketing: Types of Emails in email marketing, Email Marketing best practices

Unit 3: Social Media Marketing and Display Marketing

Social Media Marketing: Building Successful Social Media strategy; Social Media MarketingChannels; Facebook, LinkedIn, YouTube (Concepts and strategies)

Display Advertising: Working of Display Advertising; Benefits and challenges; Overview of Display ad Process.; Define- Customer, Publisher, Objectives; Format-Budget, Media, Ad Formats, Ad Copy.

Unit 4 Search Engine Marketing

Introduction of SEM: Working of Search Engine; SERP Positioning; online search behaviour, DMI's 5P Customer Search Insights Model.
Search Engine Optimization: Overview of SEO Process; Goal Setting-Types.
On-Page Optimization: Keyword Research, SEO Process -Site Structure, Content, Technical Mechanics, Headings, Image & Alt text, Social Sharing, Sitemaps, Technical Aspects- Compatibility, Structured Data Markup.
Off Page Optimisation: Link Formats, Link Building, Content Marketing, Social Sharing; Black and White Hat Techniques
Search Advertising: Overview of PPC Process; Benefits of Paid Search; Basis of Ranking; Goal Setting-Objectives; Account Setting-Creation of Google Ads, Campaign architecture, Campaign setup, Targeting, Bid Strategy, Delivery, Ad Scheduling, Ad Rotation, Keyword Selection; Ad Copy composition, Ad Extension

Essential/recommended readings

- Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.
- Kartajaya, H., Kotler, P., & Setiawan, I. (2016). Marketing 4.0: moving from traditional to digital. John Wiley & Sons.
- Ryan, Damien: Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.

Suggested Readings

- Moutusy Maity: Internet Marketing: A practical approach in the Indian Context:
- Oxford Publishing
- Seema Gupta: Digital Marketing: Mcgraw Hill
- Ultimate guide to digital Marketing by Digital Marketer

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Course Title – Graphic Design and Animation

Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce the students to the skill of animation.
- To learn about the application of 2D and 3D animation.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the importance of animation and graphics design
- After studying this course, students will be able to learn graphics design in 2D and 3D animation.
- After studying this course, students will be able to learn the application of graphics design in 2D and 3D animation in advertising and other areas.

SYLLABUS

Unit 1:2D Animation

Introduction to 2D Animation: Introduction to 2D Animation, Drawing concept, Colour theory & basics, Incorporating sound into 2D animation

Layout & Designing: Basic of sketching, still life and assignment of basic drawing, Composition of basic elements, Work in different media, such as drawing, collage, and painting, Explore the relationship between elements and principal, Pixel and resolution: Vector and Bitmap Graphics.**Graphics and advertising (Practical)**

- Creating Digital Layout
- Professional image editing (PHOTOSHOP)
- Advertising and relevant case , Graphics and illustration (Corel Draw, Paint)
- Vector Composition , 2D animation (Macromedia Flash)

Broadcast Design (Practical)

- Working with visual images
- Story Boarding
- Titles and Credit Making
- Stop motion animation

Production / Post-Production (Practical)

- Paint & animate (scanning, tracing, ink & Paint)
- Understanding Background composition
- Basic Understanding of 2D animation and technique
- Animation with flash, Portfolio Making

Unit 2: 3D Animation

3D Modeling: Introduction to 3D space in Blender, Introduction to Modeling Techniques, In-organic Modeling, Organic Modeling

3D Shading: Use of Materials & Shader, Shader and Texture Editing, Shading Organic Model, Shading In-Organic Models

3D Animation and Rigging (Practical)

- Introduction to 3D Animation
- Create, Edit and working with Animation Graph, Rigging using Blender
- Setting up controllers for joints
- Simple Skeleton structure with proper joint orientation

3D Lighting and Rendering (Practical)

- Understanding Lighting in Cycles
- Direct and Indirect Lighting
- Light Linking, Final Composition
- Creating composition and Light with the Shaded Models

3D Dynamics (Practical)

Introduction to Dynamics, Active and Passive Bodies
Creating basic Simulation and collusion using Rigid body
Cloth Simulation, Simulation of Brick wall collusion
Introduction to Fluid Effects, Creating fluid simulation

Project

(Digital Imaging)

- Design Print advertisement for Service
- Design Print advertisement for Product
- Design Print advertisement an Event
- Design Print advertisement on Social Awareness
- Design a collage with a social message

2D Animation

- Drawing fundamentals using lines
- Sketching of cartoon characters
- 2D Logo designing
- Storyboarding of a 30 seconds film
- Portfolio making of an organization

3D Animation

- Exploring the Interface of 3D application & Basic Modeling
- Create different types of Materials and create a Shading
- Create a simple walk cycle using the character rigs
- Create a composition and Light set up
- Create a Fluid simulation & rendering

Suggested Readings:

- The Illusion of Life: Disney Animation, Ollie Johnston and Frank Thomas, Disney Editions.
- Blender Production Creating Short Animations from Start to Finish, Roland Hess, Routledge.
- Animating with Blender: Creating Short Animations from Start to Finish, Roland

Hess, Focal Press

- Simplified Drawing for Planning Animation, Wayne Gilbert, Anamie Entertainment Ltd.
- Getting Started in 3D with Maya, Adam Watkins, Routledge,
- Creating Characters with Personality: For Film, TV, Animation, Video Games, and Graphic Novels, Tom Bancroft, Watson-Guptill
- Force: Dynamic Life Drawing for Animators, Mike Mattesi, Focal Press

Note: Learners are advised to use the latest edition of readings.

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Course Title – Introduction to Cloud Computing (AWS)

Learning Objectives

The Learning Objectives of this course are as follows:

- To learn about cloud computing through Amazon Web Services (AWS) platform.
- To learn about AWS cloud concepts, services, security and architecture to build an application.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to Understanding cloud computing platform
- After studying this course, students will be able to differentiate between on-premises, hybrid-cloud, and all-in cloud
- After studying this course, students will be able to describe the basic global infrastructure of the AWS Cloud
- After studying this course, students will be able to understanding the core AWS services, including compute, network, databases, and storage.

SYLLABUS

Unit 1

Introduction to cloud computing, Creating AWS account, AWS Management Console, AWS Documentation overview, Availability Zones, AWS Global Infrastructure.

Unit 2

Compute in the Cloud Amazon EC2, instance types.

Unit 3

Storage and Databases: - Amazon Simple Storage Service (Amazon S3),Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB.

Project

Create an AWS account and implement AWS cloud for deploying any application.

Suggested Sources

- Any free platform can be used, for example Amazon, Google, Azure etc.

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Course Title – Personal Financial Planning

Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize students with different aspects of personal financial planning like savings, investment, taxation, insurance, and retirement planning
- To develop the necessary knowledge and skills for effective financial planning.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the meaning and appreciate the relevance of financial planning.
- After studying this course, students will be able to understand the concept of investment planning and its methods.
- After studying this course, students will be able to examine the scope and ways of personal tax planning.
- After studying this course, students will be able to analyse insurance planning andits relevance.
- After studying this course, students will be able to develop insight into retirement planning and its relevance.

SYLLABUS

Unit 1: Introduction to Financial Planning:
Financial goals, steps in financial planning, budgeting incomes and payments, time value of money. Introduction to savings, benefits of savings, management of spending & financial discipline, Setting alerts and maintaining sufficient funds for fixed commitments.

Unit 2: Investment Planning:
Process and objectives of investment, concept and measurement of return & risk for various asset classes, measurement of portfolio risk and return, diversification & portfolio formation. Gold bond; Real estate; Investment in greenfield and brownfield Projects; Investment in fixed income instruments, financial derivatives & commodity market in India. Mutual fund schemes; International investment avenues. Currency derivatives and digital currency.

Unit 3: Personal Tax Planning:
Tax structure in India for personal taxation, Scope of personal tax planning, exemptions and deductions available to individuals under different heads of income and gross total income. Comparison of benefits - Special provision u/s 115 BAC vis-a-vis General provisions of the Income-tax Act, 1961, tax avoidance versus tax evasion.

Unit 4: Insurance Planning:
Need for insurance. Life insurance, health insurance, property insurance, credit life insurance and professional liability insurance.

Unit 5: Retirement Benefits Planning:

Retirement planning goals, process of retirement planning, Pension plans available in India, Reverse mortgage, Estate planning.

Practical Exercises:

The learners are required to:

- Perform electronic fund transfers through net banking and UPI.
- Identify certain recent Ponzi schemes in the market.
- Prepare tax planning for a hypothetical individual.

Suggested Readings:

- Halan, M. "Let's Talk Money: You've Worked Hard for It, Now Make It Work for You" Harper Collins Publishers, New York.
- Indian Institute of Banking & Finance. "Introduction to Financial Planning" Taxmann Publication, New Delhi.
- Keown A.J. "Personal Finance" Pearson, New York.
- Madura, J. "Personal Finance", Pearson
- Pandit, A. "The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd., Mumbai.
- Sinha, M. "Financial Planning: A Ready Reckoner" McGraw Hill Education, New York.
- Tripathi, V. "Fundamentals of Investment" Taxmann Publication, New Delhi.

Note: Learners are advised to use the latest edition of readings.

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Course Title – Personality Development and Communication

Learning Objectives

The Learning Objectives of this course are as follows:

- To develop inter personal and effective communication skills.
- To develop problem solving skills and understand its influence on behaviour and attitudes of individuals.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the importance of oral and written communication in day-to-day working of the organisation.
- After studying this course, students will be able to develop inter personal skills and problem-solving skills.
- After studying this course, students will be able to understand the role of body language in effective communication.

SYLLABUS

Unit 1

Introduction, need for Communication, Process of Communication, Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication, Inter-cultural, Intra-cultural, Cross-cultural and International communication, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

Unit 2

Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos, Business Presentations to Customers and other stakeholders, presenting a Positive Image through Verbal and Non-verbal Cues, Preparing andDelivering the Presentations, Use of Audio-visual Aids, Report Writing.

Unit 3

Barriers to Communication, Improving Communication Skills, Preparation of Promotional Material, Non-verbal communication, Body language, Postures and gestures, Value of time, Organizational body language, Importance of Listening, Emotional Intelligence. Working individually and in a team, Leadership skills, Leadership Lessons, Team work and Team building, Feedback, Feed forward Interpersonal skills - Delegation, Humour, Trust, Expectations, Values, Status, Compatibility and their role inbuilding team - work Conflict Management - Types of conflicts, how to cope with conflict.

Unit 4

Negotiation Skills, Types of Negotiation, Negotiation Strategies, Selling skills - Selling to customers, Selling to Superiors Selling to peer groups, team mates and subordinates, Conceptual selling, Strategic selling, Selling skills - Body language.

Essential/recommended readings

- Kushal Jin - Business Communication, VK India.
- Krishnamacharyulu, C. S. G, Ramakrishnan Lalitha - Personality Development, Interpersonal Skills and Career Management, Himalaya Publishing.
- Corvette Budjac - Conflict Management: A Practical Guide to Developing NegotiationStrategies, Pearson.

Suggestive Readings

- Mitra, B. K., Personality Development and Soft Skills, Oxford University Press.
- Kumar Sanjay and Pushplata, Communication Skills, Oxford University Press.
- Mandal S. K., Effective Communication and Public Speaking, Jaico Publishing.

Note: Latest edition of the readings may be used

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Course Title – Prospecting E-waste for Sustainability

Learning Objectives

The Learning Objectives of this course are as follows:

- To provide in-depth knowledge on the effective mechanisms to regulate the generation, collection, and storage of e-waste
- To gain insights into the internationally/nationally acceptable methods of transport, import, and export of e-waste within and between countries
- To develop a holistic view on recycling, treatment, and disposal of e-waste and related legislative rules.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to holistically analyze the environmental impacts of e-waste
- After studying this course, students will be able to apply the skills and various concepts for sustainable management of e-waste
- After studying this course, students will be able to decipher the role of various national and international regulations for e-waste management
- After studying this course, students will be able to provide specific recommendations for improved methods for handling e-waste at different stages such as generation, collection, storage, transport, and recycling.

SYLLABUS

Practical/Hands-on Exercises

- Identification of e-waste and its types
- Composition of e-waste and segregation- from the material provided
- Dismantling of e-waste and handling process
- Visit a nearby e-waste handling facility

- Environmental protection laws and producer's responsibility for e-wastemanagement Build an understanding of how regulatory mechanisms can be utilized in the management of e-waste in educational institutions.
- Discussion on plausible ways and implementation of e-waste reduction at the source Evaluation of the status of e-waste handling at your institution. Suggest potential solutions as per the existing norms of E-Waste (Management) Rules, 2016 and beyond.
- Estimate how recycling of e-waste in metro cities will go in sync with the circular economy
- Develop an understanding and itinerary of the process for procuring e-waste import permissions.
- Inventory of the e-waste disposal mechanisms.
- Study the evolution of e-waste management rules and its implementation- Hazardous Waste Rules, 2008, E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016
- Study the international laws on e-waste management- the international legislations:The Basel Convention; The Bamako Convention; The Rotterdam Convention;
- Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union; Restrictions of Hazardous Substances (RoHS) Directive

Teaching and learning interface for practical skills:

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c)customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Prospective sector(s):

© Electric and electronic industries,
® E-waste Recycling Unites,
® Private entrepreneurs,
• Environmental consultancies,
© Pollution Boards, and
© Environmental NGOs

Suggested Readings:

- Hester, R.E. and Harrison, R.M., 2009. Electronic Waste Management:
- Design. Analysis and Application. Royal Society of Chemistry Publishing.
- Cambridge, UK.
- Fowler, B.A., 2017. Electronic Waste: Toxicology and Public Health Issues.Academic Press.
- Gaidajis, G., Angelakoglou, K. and Aktsoglou, D., 2010. E-waste:environmental
- problems and current management. Journal of Engineering Science and
- TechnologyReview, 3(1), pp. 193-199.
- Janyasuthiwong, S., 2020. Metal Removal and Recovery from Mining
- Wastewaterand E-waste Leachate. CRC Press.

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Course Title – Public Speaking in English Language and Leadership

Learning Objectives

The Learning Objectives of this course are as follows:

- To impart leadership skills to students along with adequate communication skills tocurate strong leaders in the emerging social, political and corporate world.
- To create leaders with ethics and resilience in industry-based fields as well as social
- fields.

® To allow students to realise their leadership skills and curate them through a hand-on practical approach which will be helpful in generating employable skills for them.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to learn effective communication through Public Speaking will instill leadership development among students.
- After studying this course, students will be able to lead in different fields at the undergraduate level, be responsible citizens and employ leadership skills in their future endeavours, too.
- After studying this course, students will be able to strengthen their critical mindset, help them being assertive and put forward constructive viewpoints employing the skills learnt in the practice sessions.

SYLLABUS

UNIT 1

© Introduction to Effective Communication- Features, Advantages & Disadvantages

- Importance of Listening
- Oral communication- Meaning, Features & Importance
- Reading Public Speech- Reading documented speeches delivered in the past; Understanding the art of word play, vocabulary and putting thoughts into words

UNIT 2

- Public Speaking-
  - V What is Speech?, Overcoming Fear of Public Speaking, Language of Public Speech
  - V Drafting a Public Speech (Reading, research, writing, Fact check, Re-writing, Delivery)
  - Y' 3P's of Public Speaking (Preparation, Practice, Performance)
  - *S* Rhetoric Skills, Art of Informative & Persuasive speaking, Concluding Speech with Power
- Types of Public Speaking-
  - *S* Physical & Online
  - *S* Political, Organisational, Educational & Motivational
  - *S* Ted Talks, Public Speaking in Media
- Listening in groups and Discussion- Listening famous speeches (from history & everyday life); Analysis of its elements & classroom discussion
- Writing Public speech- Classroom Practice Sessions

UNIT 3

- Leadership Skills- (2 hrs.)
  - S Meaning, Features & Importance
  - S Historical Overview
  - S Leadership in Academic Life, Corporate Space, Public Life, Social Leadership and Political Leadership
- Leadership & Innovations- (2 hrs.)
  - S Audience analysis
  - S Audience Engagement & Leadership
  - S Influencing through Leadership
- Execution & Delivery of Public Speech- Learning rhetorics through speeches in the form of Audio/ Video; Learning Body Language & Paralanguage through ICT
- Developing leadership competence through Public Speaking- Intra-class Speech Competitions; Extempore; Group Discussion

UNIT 4

- Importance of Public Speaking in developing Leadership Skills
- Ethics in Public Speaking & Leadership
- Mock Parliament/MUNs
- Workshop

Suggested Readings:

S Beebe, S. A., & Beebe, S. J. (2012). Public speaking: An audience-centredapproach. (8th ed.). Boston: Pearson.

S Cardon, P. (2014). Business communication: Developing leaders for a networkedworld. (international ed.). New York: McGraw-Hill.

S Jaffe, C. I. (2013). Public speaking: Concepts & skills for a diverse society. (7thed.). Boston: Cengage Learning.

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Course Title – Statiscal Software Package

Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize students with data analysis using a statistical software package like SPSS or any other equivalent.
- To provide skills for research analysis and increase employability.
- To lay a foundation for advance data analysis work and higher education.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand basic functions of statistical software package for managing variables and generate descriptive statistics to describe the data and analyze data through graphs and charts.
- After studying this course, students will be able to test differences in sample means.
- After studying this course, students will be able to identify relationships between variables and develop models for predicting dependent variables on the basis of independent variables.
- After studying this course, students will be able to understand data structures and identify clusters in data.
- After studying this course, students will be able to identify principal components that are relevant from a host of variables.

SYLLABUS

Unit 1: Getting started with the Software

Introduction: Data Entry, Storing and Retrieving Files, Generating New Variables; Managing Data - Listing cases, replacing missing values, computing new variables, recoding variables, selecting cases, sorting cases, merging files, Graphs - Creating and editing graphs and charts; Descriptive Statistics Procedures: Frequencies, Descriptive,Explore, Cross Tabulation.

Unit 2: Hypothesis Testing for Means

T-tests: One sample test, Independent samples and paired samples t-test; ANOVA - One- way analysis of variance with post hoc analysis, Two-way analysis of variance.

Unit 3: Testing for Association between Variables

Chi-square Test of Independence; Bivariate Correlation Analysis: Simple Scatter Plot; Correlation Coefficient: Pearson, Spearman Rho and Kendall Tau Coefficient. Factor analysis.

Unit 4: Regression Analysis

Linear Regression: Simple Linear Regression, Multiple regression analysis with matrix scatterplot. Multiple Regression: Standard (Enter) and Stepwise Method. Binary Logistic Regression.

Essential/recommended readings

- Performing Data Analysis using IBM SPSS, Lawrence S. Meyers, Glenn C. Gainst, J. Guarino, Wiley Publication
- SPSS for Windows Step by Step A Simple Guide and Reference, Darren George andPaul Malley
- SPSS in Simple Steps, Kiran Pandya, Smruti Bulsari, Sanjay Sinha, Dreamtech Press

Suggestive Readings

- Using SPSS in Research, Dr. Radha Mohan, Neelkamal.

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Corse Title – Sustainable Ecotourism and Enterpreneurship

Learning Objectives

The Learning Objectives of this course are as follows:

- To train students in concepts and principles of sustainable ecotourism leading to a new generation of entrepreneurs
- To inculcate field-based practical skills in translating ecological systems into wealth generation while conserving natural resources
- To transform local biological wealth into a hub of global attraction and generate a scientific basis of Indian traditional knowledge

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to develop next-generation ecological entrepreneurs
- After studying this course, students will be able to evolve eco-literate society by integrating market-based instruments with eco-cultural knowledge of traditional societies
- After studying this course, students will be able to practice ecological knowledge for wealth generation, environmental conservation, and popularization of Indian traditional knowledge

SYLLABUS

Practical/Hands-on Exercise

- Assess the current state of ecotourism in little-known/explored areas and examine ecotourism potential
- Field surveys to identify the existing locations having ecological, wildlife, scenic, and ethnic potential for ecotourism and analyze existing prevalent eco-practices having the potential to integrate with ecotourism programme
- Identify ten plant species having ecological, economic, and cultural significance as ecotourist attraction
- Develop stories on the selected wild habitats to attract ecotourists from within and outside the country
- Identify suitable track and prepare a checklist of birds and animals with their stories for a diverse group of ecotourists
- Examine the current state of natural resources and develop suitable messages and appropriate media for educating different target groups
- Survey and identify the target group for ecotourism based on their age, education, economic and other criteria and evaluate their psychological barriers to ecotourism
- Conduct inventory of facility and analyze a preliminary competitive advantage over ecological attractions in the nearby area
- Analyze tourist spending patterns and track preferences for ecotourism attractions in nearby areas and add value to ecological, wildlife, and cultural attractions
- Survey attitude and perception of residents regarding ecotourism plan and analyze costs and benefitsof the sustainable ecotourism development programme using a demand-driven marketing approach
- Develop messages, stories, and pictures to attract tourists and promote ecotourism in the target area
- Analyze basic elements of ecotourism, the special needs of ecotourists, develop trips and travel packages offering an array of experiences and predict the market trends
- Develop ecotourist activities for individuals, families, and groups and craft social media campaigns for the proposed ecotourism business
- Develop a plan for strategic alliances and partnerships with other projects/groups /organizations for public- private partnership in the proposed ecotourism programme.

Teaching and learning interface for practical skills:

To impart training on technical and analytical skills related to the course objectives, a wide range of learningmethods will be used, including

(a) laboratory practical;

(b) field-work exercises;

(c) customized exercises based on available data;

(d) survey analyses;

(e) developing case studies;

(f) demonstration and critical analyses;

(h) experiential learning individually and collectivelyrospective sector(s):

- Forest Departments
- Tourism industry .
- World Bank
- UNDP
- WWF
- Environmental NGOs

Suggested Reading:

- Ballantyne, R. and Packer, J., 2013. International Handbook on Ecotourism. Edward Elgar Publishing Limited, UK
- Blumstein, D.T., Geffroy, B., Samia, D.S. and Bessa, E., 2017. Ecotourism's promise and
- Peril. A Biological Evaluation. Springer Int. Publ. (Chapters 10-11)
- Fennell, D.A., 2014. Ecotourism. An Introduciton. Routledge, London, UK.
- Fletcher, R., 2014. Romancing the wild. In Romancing the Wild. Duke University Press.
- Tanguay, G.A., and Rajaonson, J., (2015). Evaluating Sustainable Tourism Using Indicators:
- Problems and Solutions. In: Brophy, S.C., (Ed), Ecotourism: Practices, Benefits and o Environmental Impacts. Nova Science Publishers, pp. 119 - 134.
- Wearing, S. and Schweinsberg, S., 2019. Ecotourism: Transitioning to the 22nd century. Routledge

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Course Title – Visual Communication and Photography

Learning Objectives

The Learning Objectives of this course are as follows:

- To synthesize a comprehensive view of principles involved in Visual Communication.
- To appreciate and express the cultural significance of photography as visual art and understand its evolution and purposes.
- To develop an awareness of compositional and organizational strategies for the effective deployment of formal elements of visual art.
- To read visual texts with a deep knowledge of visual history and theory.
- To create an ability of situating the content and form of the visual representation of thematic context.

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to acquire knowledge of the
- culturaland historical importance of the visual medium.
- After studying this course, students will be able to explore the
- fundamentals andunderlying theories of Visual Communication.
- After studying this course, students will be able to develop a thorough
- knowledge ofconcepts, and skills in creating photographs.
- After studying this course, students will be able to learn to identify and
- analyzesemiotics in photographs.
- After studying this course, students will be able to develop a craftsmanship in
- creating aesthetically pleasing photographs.

SYLLABUS

Unit 1: Historical Background and Basics of Visual Communication

Unit Description: The Unit I will give a brief history of the visual arts from the caveman to modern man. Skills of artistic schools of thought and Intertextuality in art in relation to culture.

Topics- Concept and History of Visual Communication, Human Eye and Visual Process, Visual culture and Information Education Communication, Theories of visual communication - Gestalt Theory of visual communication, Perceptual theory of Visual communication, Semiotics and cognitive approach in visuals

Unit II: Theories of Visual Communication

Unit Description: This unit will put emphasis on theories, semiotics and the study of signs. Through semiotic theories improve critical thinking skills, and learn to use semiotics to think logically and to analyze visual media in context of culture.

Topics: Fundamentals of Design: Definition. Approaches to Design, Centrality of Design, Elements of Design, Principles of Visual and other Sensory Perceptions. Colour psychology and theory (some aspects), Definition, Optical / Visual Illusions, etc., Various stages of design process, Learning skills to read signs and signifier in visuals for social messaging

Unit III: Photography as Visual Communication

Unit Description: This unit will provide skills to learn camera and lighting techniques.

Topics: Introduction to photography, Camera - structure and function of camera ,

Characteristics of light, Sources of Light-Nature, Artificial and Available, Lighting techniques-three-point lighting, Exposure - focusing, aperture, shutter speed, Depth of field.
, Kinds of light indoor and outdoor - Electronic flash and artificial lights, Light meters

Unit IV: Camera Compositions and Accessories

Unit Description: This unit will provide skills about camera accessories and designing aesthetically rich compositions.

Topics: Camera lenses and accessories, Basic shots, angle, and view, Composition, Role of photographic image in visual communication, Basics of photojournalism, photo-features, photo - essays, writing captions, visual storytelling.

Essential Readings

- Barnes, Susan B. An Introduction to Visual Communication: From Cave Art to Second Life, Peter Lang Pub, 2011.
- Berger, Arthur Asa, Seeing is Believing: An Introduction to Visual Communication, McGraw-Hill Education, 2012.
- Lester, Paul Martin, Visual Communication: Images with Messages (6ed), Cengage Learning, 2013.
- Photography: A Critical Introduction - edited by Liz Wells London, Routledge, Oxon, 2015.
- Farrell, I. Complete Guide to Digital Photography, Quercus Publishing, UK, 2014.

Suggested Readings

- Mandav, Pradeep, Visual Media Communication, Authors Press, 2001.
- Williams, Rich, Visual Communication: Integrating Media, Art, and Science, Routledge, 2007

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Course Title - पटकथा लेखन

Course Objective

- पटकथा लेखन का परिचय कराना।
- विद्यार्थी की लेखन–क्षमता और भाषा–कौशल को बढ़ावा देना।
- विद्यार्थी की लेखन में रोजगार सम्बन्धी क्षेत्रों के लिए तैयार करना।

Course Learning Outcomes:

- पटकथा लेखन तथा उसके तकनीकी शब्दों से विद्यार्थी अवगत हो सकेगा।
- पटकथा लेखन की जानकारी मिलने के उपरान्त विद्यार्थी के लिए रोजगार की संभावनाएँ बनेंगी।
- विद्यार्थी भाषायी सम्प्रेषण को समझते हुए लेखन से सम्बन्धित विभिन्न पक्षों से अवगत हो सकेगा।
- विद्यार्थी में अभिव्यक्ति कौशल का विकास हो सकेगा।

SYLLABUS

यूनिट 1

- पटकथा लेखनः परिचय
- पटकथा के तत्व
- पटकथा के प्रकार
- पटकथा की शब्दावली

यूनिट 2

- पटकथा लेखन में शोध का महत्व
- चरित्र की निर्मिति और विकास
- एक दृश्य का लिखा जाना
- तीन अंक (थ्री एक्ट) और पाँच अंक (फाइव एक्ट) को समझना

यूनिट 3

- वेबसीरीज के लिए पटकथा लेखन
- लघु फिल्म के लिए पटकथा लेखन
- वृत्तचित्र के लिए पटकथा लेखन
- विज्ञापन फिल्म के लिए पटकथा लेखन

यूनिट 4

- पटकथा का पाठ और विश्लेषण
- किसी आईडिया को स्क्रीन प्ले के तौर पर विकसित करना

सन्दर्भ पुस्तकें:

- पटकथा कैसे लिखें: राजेद्र पांडेय – वाणी प्रकाशन, दिल्ली, संस्करण 2015
- पटकथा लेखन : एक परिचय – मनोहर श्याम जोशी– राजकतल प्रकाशन, दिल्ली संस्करण 2000
- कथा–पटकथा : मन्नू भंडारी – वाणी प्रकाशन, दिल्ली , संस्करण 2014
- व्यावहरिक निर्देशिका: पटकथा लेखनः असगर वजाहत – राजकमल प्रकाशन, दिल्ली, संस्करण 2011
- आईडिया से परदे तकः रामकुमार सिंह–राजकमल प्रकाशन, दिल्ली, संस्करण 2021

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Course Title - रंगमंच

Course Objective

- हिन्दी रंगमंच का परिचय कराना।
- नाट्य–प्रस्तुति की प्रकिया की जानकारी देना।
- अभिनय के विभिन्न पक्षों से अवगत करना।
- रंगमंच के खेलों और गतिविधियों से अवगत कराना।

Course Learning Outcomes:

- नाट्य–प्रस्तुति की प्रकिया से विद्यार्थी अवगत हो सकेगा।
- रंगमंच की जानकारी मिलने के उपरान्त इस क्षेत्र में विद्यार्थी के लिए रोजगार की संभावनाएँ बनेंगी।
- रंगमंचीय गतिविधियों से विद्यार्थी के व्यक्तित्व का विकास हो सकेगा।
- विद्यार्थी में अभिव्यक्ति कौशल का विकास हो सकेगा।

SYLLABUS

यूनिट 1

- भरत मुनि कृत नाट्यशास्त्र (संक्षिप्त परिचय)
- हिन्दी का पारंपरिक रंगमंच (संक्षिप्त परिचय)

यूनिट 2

प्रस्तुति–प्रकिया: आलेख का चयन, अभिनेताओं का चयन,दृश्य–परिकल्पना (ध्वकन–संगीत–नृत्य–प्रकाश), पूर्वाभ्यास

यूनिट 3

अभिनय की तैयारीः वाचिक, आंगिक, आहार्य, सात्विक

यूनिट 4

आशु अभिनय, थिएटर गेम्स, संवाद–वाचन, शारीरिक अभ्यास, सीन वर्क

यूनिट 5

मंच प्रबंधनः सेट, रंग–सामग्री, प्रचार–प्रसार, ब्रोशर–निर्माण

सन्दर्भ पुस्तकें:

- संक्षिप्त नाट्यशास्त्रम् – राधावल्लभ त्रिपाठी, वाणी प्रकाशन, दिल्ली, 2009
- रंग स्थापत्यः कुछ टिप्पणियाँ – एच0 वी0 शर्मा राष्ट्रीय नाट्य विद्यालय प्रकाशन, दिल्ली संस्करण 2004
- पारंपरिक भारतीय : रंगमंच अनंतधाराएँ – कपिला वात्स्यायन, अनुवाद–बदी उजम्मा, नेशनल बुल ट्रस्ट, दिल्ली, 1995
- हिंदी रंगमंच का लोकपक्ष, सं प्रो0 रमेश गौतम, स्वराज प्रकाशन, दिल्ली 2020
- मंच आलोकन – जी0 एन0 दासगुप्ता, अनुवाद – अजय मलकानी, नेशनल बुक ट्रस्ट, दिल्ली 2006
- रंगमंच के सिद्धांत –सं महेश आनंद, देवेन्द्र राज अंकुर, राजकमल प्रकाशन, दिल्ली 2008

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Course Title- रचनात्मक लेखन

Learning Objectives

- विद्यार्थीयों के मौखिक और लिखित अभिव्यक्ति कौशल को विकसित करना।
- उनमें कल्पनाशीलता और रचनात्मकता का विकास करना।
- साहित्य की विविध विधाओं और उनकी रचनात्मक शैली का परिचय कराते हुए लेखन की ओर प्रेरित करना।
- प्रिंट एवं इलेक्ट्रानिक माध्यमों के लिए लेखन की प्रवृति को विकसित करना।

Learning outcomes

The Learning Outcomes of this course of this course are as follows:

इस पाठ्यकम के अध्ययन के पश्चात् विद्यार्थीयों में :

- मौखिक और लिखित अभिव्यक्ति कौशल को विकसित होने में मदद मिलगी।
- उसमें कल्पनाशीलता और रचनात्मकता का विकास हो सकेगा।
- साहित्य की विधि विधाओं और उनकी रचनात्मकता शैली का परिचय होगाा जिससे वे स्वयं भी विधाओं में लेखन की अग्रसर हो सकेगे।
- प्रिंट एवं इलेक्ट्रानिक माध्यमों के लिए लेखन की ओर भी ये अग्रसर होंगे।

SYLLABUS

यूनिट 1

रचनात्मक लेखकः अवधारणाः स्वरूप आधार एवं विश्लेषण

- भाव एवं विचार की रचना में अभिव्यक्ति की प्रकिया
- अभिव्यक्ति के विविध क्षेत्रः साहित्य पत्रकारिता विज्ञापन भाषण

- लेखन के विविध रूपः मौखिक–लिखित गद्य–पद्य कथात्मक–कथेतर
- अर्थ निर्मित के आधारः शब्द और अर्थ की मीमांसा शब्द के पुराने–नए प्रयोग, शब्द की व्याकरणिक कोटि

यूनिट 2

भाषा भंगिमा और साहित्य लेखन

- भाषा भंगिमाएँः औपचारिक–अनौपचारिक, मौखिक–लिखित, मानक भाषिक संदर्भः क्षेत्रीय, वर्ग–सापेक्ष, समूह–सापेक्ष
- रचना–सौष्ठवः शब्दशक्ति, प्रतीक, बिम्ब, अलंकारवक्रता
- कविताः संवेदना भाषिक सौष्ठव, छंदबद्ध–छंदमुक्त, लय, गति, तुक
- कथा–साहित्यः वस्तु, पात्र, परिवेश, कथ्य और भाषा

यूनिट 3

विविध विधाओं एवं सूचना माध्यमों के लिए लेखन

- नाट्य–साहित्यः वस्तु, पात्र, परिवेश, कथ्य, रंगमंच और नाट्य–भाषा
- विविध गद्य विधाएँः निबंध, संस्मरण, आत्मकथा, व्यंग्य,रिपोर्ताज, यात्रा–वृत्तांत
- प्रिंट माध्यम के लिए लेखनः फीचर, यात्रा–वृत्तांत, साक्षात्कार, विज्ञापन
- इलेक्ट्रानिक माध्यम के लिए लेखनः विज्ञापन, पटकथा, संवाद

Practical Exercises if any:

नोटः उपर्युक्त का परिचय देते हुए इनका अभ्यास भी करवाया जाए।

References and suggested readings

1. साहित्य चिंतनः रचनात्मक आयामः रघुवंश
2. शैलीः रामचंद्र मिश्र
3. रचनात्मक लेखकः सं0 रमेश गौतम
4. कविता क्या हैः विश्वनाथ प्रसाद तिवारी
5. कथा–पटकथाः मन्नू भंडारी
6. पटकथा लेखनः मनोहर श्याम जोशी
7. कला की जरूरतः अर्नेस्ट फिशरः अनुवादकः रमेश उपाध्याय
8. साहित्य का सौंदर्यशास्त्रः रवींद्रनाथ श्रीवास्तव
9. कविताः रचना–प्रकियाः कुमार विमल

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Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System

Value Added Course (VAC)

Semester – I (VAC- 1)

Science	Social Science/Arts	Commerce
• Ayurveda & Nutrition • Financial Literacy • Ethic & Culture • Art of Being Happy • Swach Bharat • Fit India • Panchakosha: Holistic Development of Personality • Culture & Communication	• Gandhi & Education • Sports for life • Ethic & Culture • Art of Being Happy • Swach Bharat • Fit India • Panchakosha: Holistic Development of Personality • भारतीय भक्ति परम्परा और मानव मूल्य	• Digital Empowerment • Sports for life • Ethic & Culture • Art of Being Happy • Swach Bharat • Fit India • Panchakosha: Holistic Development of Personality • Culture & Communication

Semester – II (VAC- 2)

Science	Social Science/Arts	Commerce
• Vedic Mathematics • Emotional Intelligence • Yoga Philosophy & Practice • Ethics & Values in Ancient Indian Tradition • Constitutional Values & Fundamental Duties • Social & Emotional Learning • Ecology & Literature	• Vedic Mathematics • Emotional Intelligence • Yoga Philosophy & Practice • Ethics & Values in Ancient Indian Tradition • Constitutional Values & Fundamental Duties • Social & Emotional Learning • सृजनात्मक लेखन के आयाम	• Vedic Mathematics • Emotional Intelligence • Yoga Philosophy & Practice • Ethics & Values in Ancient Indian Tradition • Constitutional Values & Fundamental Duties • Social & Emotional Learning • Ecology & Literature

List of Value-Added Course (VAC)

SL. No.	Course Title	LTP Distribution of the Course			Total Credits:	Total Marks = 100
		L	T	P		
1	Art of Being Happy	1	0	3	3	End -Term Appraisal : 70 Marks Internal Assessment: 30 Marks
2	Ayurveda & Nutrition	1	0	3	3	
3	Constitutional Values & Fundamental Duties	1	0	3	3	
4	Culture & Communication	1	0	3	3	
5	Digital Empowerment	1	0	3	3	
6	Ecology & Literature	1	0	3	3	
7	Emotional Intelligence	1	0	3	3	
8	Ethics and Culture	1	0	3	3	
9	Ethics & Values in Ancient Indian Tradition	1	0	3	3	
10	Financial Literacy	1	0	3	3	
11	Fit India	1	0	3	3	
12	Gandhi & Education	1	0	3	3	
13	Panchakosha: Holistic Development of Personality	1	0	3	3	
14	Social & Emotional Learning	1	0	3	3	
15	Sports for life	1	0	3	3	
16	Swach Bharat	1	0	3	3	
17	Vedic Mathematics	1	0	3	3	
18	Yoga Philosophy & Practice	1	0	3	3	
19	भारतीय भक्ति परम्परा और मानव मूल्य	1	0	3	3	
20	सृजनात्मक लेखन के आयाम	1	0	3	3	

Value Added Courses (VAC)

Course Title – Arts of Being Happy

Course Objectives

- To synthesize the insights developed by Human Development experts, Psychologists, Anthropologists on one hand, and the intellectual traditions of Vedantic Philosophy and Indology on the other towards the experience of happiness.
- To illustrate various factors that determine the subjective experience of happiness in a cross cultural context.

Learning Outcomes

- The students shall be able to evaluate the factors contributing to the phenomenon of happiness in the personal, familial and community life of an individual in different cultures in the Indian context.
- They will be able to develop healthy interpersonal relationships and wellbeing, cherishing the values of Indian culture and philosophy.
- They will be able to relate to the global phenomenon of sustainable development and become sensitive to the needs of the planet.
- They will be able to apply the experience of *Aananda* at a personal level.

Syllabus of *The Art of Being Happy*

Unit 1:Human Ecology and Happiness
• Definitions/Factors of Happiness: Environmental and Social • Physical, emotional and psychological well-being for happiness • Physiological and hormonal basis of happiness • Coping with Stress: A life saving skill
Unit 2:Indological Theories of Happiness
• *Panch Kosh* Theory & Idea of Well Being • Idea of Self and other • Hierarchy and stages of happiness 13

Unit 3 : Happiness: Cross-cultural Contexts
• Culture and Happiness • Interpersonal Relationship: Comparative Perspective • Towards Self-Actualization
Unit 4:Local and Global Perspective of Happiness
• Measuring happiness: Key indicators • Happiness Index • India in Global Happiness Indices

Practical/ Practice Component

The course will be based on students' identification and operationalization of the concept of happiness and well-being. Students will explore the indicators and actualization of these concepts in everyday life.

- Community surveys on the facilities promoting positive mental health practices such as Yoga and Meditation Centres, Recreation clubs, and Parks for youth and senior citizens shall be carried out by the students.
- Extending help and social service by visiting old age homes/ hospitals/slum areas or any other disadvantaged groups.
- Students can undertake a field work / project independently or work as an Intern with NGOs working in the area of happiness and well-being.
- Critical appreciation of a documentary/ film based on Happiness and Well-being can be undertaken by the students.
- Workshops/ Sessions for the actualization of innate creative potential- (Music, Drawing, Calligraphy, Dramatics)
- Hands-on Happiness: Gardening, Cleaning, Washing, Cooking, etc.
- If required, students can share their experiences in the form of a Project Report.
- Students may share their experiences in the form of Audio-video presentations of 15-20 minutes.
- Any other Practical/Practice as decided from time to time

Essential Readings

- Ramavathy, Vinayachandra & Choudry, Anuradha. (2013). Understanding Happiness: A Vedantic Perspective. Psychological Studies. 59. 141-152. 10.1007/s12646-013-0230-x.
- Leontiev, Dmitry. (2012). Anthropology of Happiness: the state of Well-Being and the way of Joy,In SocialScience,sVol43 No 2 P93-104
- Snyder .C.R. S.J. Lopez & J.T. Pedrotti. (2015). Positive Psychology (The Scientific and Practical Explorations of Human Strengths): Sage Publication. (Chapter 5: Subjective Well-being: The Science of Happiness and Life Satisfaction, Page 63 to 73)
- WorldDevelopmentIndicators2016. (2016).United States: World Bank Publications.
- Zelenski, John. (2019).

Suggested Readings

- Baumgardner,S&Crothers,M.(2014).Positive Psychology. New Delhi: Pearson Education, India.
- Goleman,D.(2007).Social Intelligence:The new science of human relationships, RHUK
- Mathews, Gordon and Carolina Izquierdo. (eds). (2010). Pursuits of Happiness: Well being in Anthropological Perspective. Berghan Books
- Seligman,M.(2002). Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment.NewYork:FreePress.
- Sri Aurobindo, The Synthesis of Yoga, Part Three: The Yoga of Divine Love, Chapter 7, The Ananda Brahman, pp. 569-570
- PositivePsychology:TheScienceofWell-Being,-CarletonUniversity,Ottawa, Canada, Sage Publications Chapter3:Happiness;page 77 to 110)

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Course Title – Ayurveda and Nutrition

COURSE OBJECTIVES:

- To introduce the basic principles of nutrition in Ayurveda
- To link the Ayurvedic nutrition with modern dietary practices for health
- To analyse basic tenets of traditional diets and health recipes
- To understand the contemporary food habits in everyday life

LEARNING OUTCOMES:

- Awareness of traditional food cultures of India
- Evaluate changing food patterns and lifestyle over the years
- Understand Indian Knowledge Systems (IKS) and key Vedic principles with respect to Food and Nutrition
- Apply basic tenets of traditional diets for health and disease
- Prepare selected healthy recipes based on Ayurvedic principles

Syllabus of *Ayurveda and Nutrition*

Unit 1: Introduction to Ayurvedic Nutrition
• Ayurveda and Indian food cultures • Nutrition and lifestyle transition over the years • Regional Food Traditions of India
Unit II: Basic principles of Food and Nutrition and Ayurveda
• Understanding rich sources of nutrients • Concept of *Doshas* & assessment • Ayurvedic Principles of food habits and factors determining quality of food *(Ahara vidhi visheshaayatana)* • FSSAI regulations on Ayurvedic Aahar
Unit III: Ayurvedic Diets
• Principles of Diet: *Aharavidhi vidhan, Sattvic, Rajasi, Tamasic* foods • Incompatible food (*Viruddha Ahara*), *Pathya; Apathya; Viprita Ahaar* • Lifestyle Management with *Dincharya* and *Ritucharya* • Application of Ayurvedic diets to stress linked food behaviour

Practical/ Practice Component

- Visit your local market and classify the available food items according to *Sattvic, Rajasi, Tamasic*foods
- Conduct a survey of 10-15 households in your locality:
  - To study food behaviour and analyse them in light of Ayurvedic dietary principles of *Sattvic, Rajasi, Tamasic*
  - To study the food consumption patterns and intake of incompatible food: *Viruddha Ahara, Pathya; Apathya; VipritaAhaar*
  - To know about their adopted lifestyle *Dincharya* and *Ritucharya*

Students are required to visit available e-resources of University of Delhi, Ministry of

- Ayushwith regard to Ayurvedaand Nutrition.
- If required, students can share their experiences in the form of a Project Report.
- The students may share their experiences in the form of audio-visual presentations of 15-30 minutes.
- Any other Practical/Practiceas decided from time to time

Essential Readings

- Rastogi S (2014) Ayurvedic Science of Food and Nutrition. ASIN: BOOHWMV094, Springer: ISBN-13:978-1461496274
- Rastogi S (2010) Building bridges between Ayurveda and modern science. Int J AyurvedaRes. 1(1):41-46.
- FSSAI regulations on Ayurveda Aahar Regulations 2022. Gazette of India CG-DL-E-07052022-235642. New Delhi, Friday, May 6, 2022/ Vaisakhal6, 1944.
- Frawley D (2012) Ayurvedichealing: A comprehensive guide. Lotus Press, India.
- https://iksindia.org/:Indian Knowledge Systems

Suggested Readings

- Charaka Samhita, Charaka (1998) In: Tripathi BN (ed) Sutra Stahan Maharashitiya Adhyay. Chaukhamba Orientelia, Varanasi.

- Kapoor Kapil & Singh AK Indian Knowledge Systems Volume– 1. Indian Institute of Advanced Study Shimla. Published by DK Printworld (P) Ltd, N.Delhi. https://www.lkouniv.ac.in

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Course Title – Constitutional Values And Fundamental Duties

COURSE OBJECTIVES:

- Enrich students with knowledge and relevance of the Constitution.
- Develop awareness about Duties and Values.
- Inculcate a sense of Constitutionalism in thought and action.

LEARNING OUTCOMES:

- Understand the Constitution and its relevance
- Appreciate the values and goals embedded in the Constitution.
- Recognise the importance of Fundamental Duties enshrined in the Constitution.
- Apply the spirit of fundamental values and duties in everyday national life.

Syllabus of *Constitutional Values and Fundamental Duties*

Unit I: **The Constitution of India – an Introduction**
• Federal Republic, Rule of Law, Separation of Powers • Sovereignty, Socialism, Democracy • Secularism and *Sarva Dharma Sama Bhava*
Unit II: Constitutional Values
• **Justice:** Social, Political, Economic • **Liberty**: Thought, Expression, Belief, Faith, Worship • **Equality** : Equality before law & equal application of laws • **Fraternity:** Dignity, Unity and Integrity
Unit III: Fundamental Duties
• Reflecting on the ancient Indian notions of righteousness and duty consciousness • Fundamental Duties- Article 51A [(a) – (k)] • Legal status of Fundamental Duties - Judicial approach

Practical/ Practice Component

- Reflections on some of the constitutional values/ fundamental duties and its contemporary relevance in day-to-day national life through group discussions and projects.
- Conduct workshops to spread awareness on the Fundamental Duties and Values.
- Students are required to conduct a survey (minimum 25 respondents) on assessing the awareness of the constitutional duties amongst the citizens.
- Students may share their experiences on Fundamental Duties and Values in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

ESSENTIAL READINGS

- *Preamble* to the Constitution of India, 1950.
- The Constitution of India, Articles - 14, 19, 21.
- The Constitution of India, Fundamental Duties [Ar. 51 A (a) – (k)].

SUGGESTED READINGS

- Durga Das Basu, *et al.*, *Introduction to the Constitution of India* (LexisNexis, 26th edn, 2022).
- Leila Seth, *We, the Children of India: The Preamble to Our Constitution* (New Delhi, Puffin Books, Penguin Books India, 2010).
- Mahendra Pal Singh, V.N. Shukla's Constitution of India, (Eastern Book Company, Lucknow, 13th revised edn. 2017)
- B.R. Ambedkar Selected Speeches, (Prasar Bharati, New Delhi, 2019) *available at:* https://prasarbharati.gov.in/whatsnew/whatsnew_653363.pdf.

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Course Title - CULTURE AND COMMUNICATION

Learning Objectives:

- To focus on traditional values disseminated from Indian cultural heritage.
- To understand the interconnections between the legacy of our past and needs of our contemporary society.
- To learn to adapt, interact and celebrate our diversity and pluralistic culture.
- To develop communication skills in speaking, listening, reading and writing and apply them in our quotidian life as young citizens of contemporary India.
- To integrate ethical values and life skills.

Course Outcomes:

- Students will be able to appreciate the relevance of ancient Indian wisdom and core ethical values in our contemporary life.
- Students will be able to engage in a dialogue between the past and the present and inculcate the best principles towards a meaningful life.
- Students will be encouraged to involve themselves in team work and group activities to address challenges faced in metropolitan cities.
- Students will be able to develop communication skills, that is, analytical reading, empathetic listening, considerate speaking as well as informed writing.
- Extension activities will equip the students, drawn from diverse backgrounds, with life skills and confidence to integrate with a multicultural environment and work towards an inclusive community.
- Students will be encouraged to envisage and work towards an ethically robust society and thereby strengthen the nation.

Unit I: Ethical Valuesfrom Indian Cultural Heritage • *VasudhaivaKutumbakam* • United WeStand, Divided WeFall • *Ek Bharat, ShreshtBharat*
Unit II: Developing Life Skills • Empathy • Adaptability • Conserving our natural resources • Sharing knowledge resources
Unit III: Effective Communication in Everyday Life • empathetic listening • considerate speaking • analytical reading • informed writing

Practical/ Practice Component

As hands-on experience is an essential component of the course, this section will focus on the practical aspects to correlate with the fundamental principles and learnings of the theory portion. Students will be encouraged to use the communicationtools learnt through Unit 3 and corroborate the continuitiesof core principles studied in Unit 1 and 2.

- Students will be asked to conduct surveys/interviews in their neighbourhood or commuting routes to assess the nature and quality of negotiating our cultural diversity and pluralist traditions.
- Students would be assigned visits to old-age homes, hospitals, cancer wards, etc. to interact and write about their experiences with old people, caregivers, patients, nursing staff, helpers, etc.

staff, helpers, etc.

- They will also be assigned visits to historically important places and monuments within the city and also converse with the tourists in order to trace a comprehensive view of the rich cultural history of India. They may create video documentaries, take and record tourists' interviews and/or write a journal entry of the visit using the communication skills learnt.

- Students shall make group presentations or individual reports on the activities undertaken. Discussions with classmates and the teacher shall be undertaken to evolve clarity of vision on the ethical values and effective communication skills learned through this course.

ESSENTIAL READINGS:

- Ramanujan, A.K. 'A Flowering Tree', *Cultural Diversity, Linguistic Plurality & Literary Traditions in India*. Department of English, OUP, 2015. pp 125-138
- Haksar, A. N. D. 'Chanakya Niti Shastra', *Chanakya Niti*. India, Penguin Random House India Private Limited, 2020.
- Dhanavel. S.P. *English and Soft Skills*. Orient Black Swan, 2010.
- Murthy, Sudha. 'The Nobel Prize', *Wise & Otherwise*. India, Penguin Random House India Private Limited, 2006.
- Murthy, Sudha. 'How to Beat the Boys', *Three Thousand Stitches: Ordinary People, Extraordinary Lives*'. Penguin Books, 2017.
- Soyinka, Wole. 'Telephone Conversations', *The Individual and Society*, Department of English, Pearson Education, 2006. pp 122-23
- Bansode, Hira. 'Bosom Friend', *The Individual and Society*, Department of English, Pearson Education, 2006. pp 49-50

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Course Title - Digital Empowerment

COURSE OBJECTIVES:

- Understand the digital world and need for digital empowerment
- Create awareness about Digital India.
- Explore, communicate and collaborate in cyberspace.
- Building awareness on cybersafety and security.

LEARNING OUTCOMES:

- Use ICT and digital services in daily life.
- Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools.
- Understand the significance of security and privacy in the digital world.
- Evaluate ethical issues in the cyber world.

Syllabus of *Digital Empowerment*
Unit I: Digital inclusion and Digital Empowerment
• Needs and challenges • Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, e-Kranti (Electronic Delivery of Services), e-Health Campaigns • Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, Education
Unit II: Communication and Collaboration in the Cyberspace
Syllabus of *Digital Empowerment*
Unit I: Digital inclusion and Digital Empowerment
• Needs and challenges • Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, e-Kranti (Electronic Delivery of Services), e-Health Campaigns • Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, Education
Unit II: Communication and Collaboration in the Cyberspace

• Electronic Communication: electronic mail, blogs, social media • Collaborative Digital platforms • Tools/platforms for online learning • Collaboration using file sharing, messaging, video conferencing
Unit III:Towards Safe and Secure Cyberspace
• Online security and privacy • Threats in the digital world: Data breach and Cyber Attacks • Blockchain Technology • Security Initiatives by the Govt of India
Unit IV: Ethical Issues in Digital World
• Netiquettes • Ethics in digital communication • Ethics in Cyberspace

Practical/ Practice Component

The course should be conducted in an interactive mode through demonstration, using appropriate tools.

• Conduct workshops on e-services initiated under Digital India.

• Spread digital literacy/awareness amongst the vulnerable groups and marginalised sections of the society like street vendors, domestic help, security guards, senior citizens.

• Students will take up team activities/ projects exploring digital services in the areas such as education, health, planning, farming, security, cyber security, financial inclusion, and justice, e-Kranti.

• Any other Practical/Practice as decided from time to time

Essential Readings /Online Resources

1. Rodney Jones and Christoph Hafner. "Understanding digital literacies: A practical Introduction". Routledge Books, 2nd edition, 2021.

2. https://www.digitalindia.gov.in

3. https://www.digilocker.gov.in

4. https://www.cybercrime.gov.in

5. https://www.cybersafeindia.in

6. https://www.meity.gov.in/cyber-surakshit-bharat-programme

Suggested Readings:

1. David Sutton. "Cyber security: A practitioner's guide", BCS Learning & Development Limited, UK, 2017.
2. https://www.mha.gov.in/document/downloads/cyber-safety-handbook

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Course Title – Emotional Intelligence

COURSE OBJECTIVES

- Introduce the concept of emotional intelligence, its models and components.
- Understand the significance of emotional intelligence in self-growth and building effective relationships.
- Identify the measures of emotional intelligence.

LEARNING OUTCOMES

- Self-Awareness, Self-Management, Social Awareness & Relationship Management.
- Discover personal competence and techniques of building emotional intelligence.
- Gain insights into establishing positive relationships.

Syllabus of *Emotional Intelligence*

Unit I: Fundamentals of Emotional Intelligence
• Nature and Significance • Models of emotional intelligence: Ability, Trait and Mixed • Building blocks of emotional intelligence: self-awareness, self-management, social awareness, and relationship management
Unit II: Personal Competence
• Self Awareness: Observing and recognizing one's own feelings, Knowing one's strengths and areas of development. • Self Management: Managing emotions, anxiety, fear, and anger.
Unit III: Social Competence
• Social Awareness: Others' Perspectives, Empathy and Compassion • Relationship Management: Effective communication, Collaboration, Teamwork, and Conflict management
Unit IV: Emotional Intelligence: Measurement and Development
• Measures of emotional intelligence • Strategies to develop and enhance emotional intelligence

Practical/ Practice Component

Students will practice self-management techniques to regulate emotions such as

- Mindfulness
- Conditioned relaxation response
- Boundary setting
- Any other

Students will practice various techniques of relationship management such as engaging with:

- Display of empathy
- Effective communication

- Teamwork
- Conflict resolution
- Any other

- If required, students can share their experiences in the form of a Project Report.

Essential Readings

- Any other Practical/Practice as decided from time to time
- Bar-On, R., & Parker, J.D.A.(Eds.) (2000). The handbook of emotional intelligence. San Francisco, California: Jossey Bros.
- Goleman, D. (2005). Emotional Intelligence. New York: Bantam Book.
- Sternberg, R. J. (Ed.). (2000). *Handbook of intelligence.* Cambridge University Press.

Suggested Readings

- HBR's 10 Must Reads on Emotional Intelligence (2015)
- HBR's 10 Must Reads on Managing Yourself (2011)
- Self Discipline : Life Management, Kindle Edition, Daniel Johnson.

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Course Title - Ecology and Literature

Course Objectives:

- To raise awareness among students towards the urgent predicament of Environmental and Ecological crisis and the need for reducing our carbon footprint upon fast depleting, ravaged ecological reserves.
- To develop a heightened ecological consciousness among students, leading to more responsible ecological behavior.
- To view environmental concerns as raised through plays, stories and poems.

Learning Outcomes:

- The course will highlight the urgency of environmental crisis, making studentsconscious and aware of the role each one of us plays.
  into environmental sensitivity and responsible
  ecologicalbehavior.
- Students will be encouraged to respond to incidents of habitat destruction, deforestation, etc. and realize the need for our urgent intervention.

Syllabus of *Ecology and Literature*

Unit I: Negotiating environmental issues creatively 1. William Wordsworth: 'In April beneath the scented thorn' 2. Rabindranath Tagore: 'The Waterfall' 3. Gieve Patel: 'On Killing a Tree'
UNIT II. Ecocritical literary representations 1. Mary Oliver: 'Sleeping in the Forest' 2.AK Ramanujan: 'A Flowering Tree'
3.Mamang Dai: 'Small Townsand the River'
UNIT III: Empathetic exploration and imaginative re-enactments 1. Amitav Ghosh's 'Part I: Stories' from *The GreatDerangement: Climate Change and the Unthinkable.* 2. ThangjamIbopishak: 'Volcano,Youcannot erupt' from *Dancing Earth: An Anthology of Poetry from North-East India* 3. ThangjamIbopishak. 'Dali, Hussain, or Odour of Dream, Colour of Wind' from *Dancing Earth: An Anthology of Poetry from North-East India*

Practical/ Practice Component

• Students would undertake field visits to a school or a slum in the neighborhood or the play area of residential complexes to share, narrate stories, poems and articulate the ideas

engaged with in the classroom lectures.

- They shall apply imaginative and creative ways of presenting socially responsible ecological behavior through re-tellings of the texts they have studied in the class.
- Creative re-enactment of key ideas studied by students in the form of a play, to be done Individually and/or in a group to create awareness regarding environmental consciousness.
- They can also collectively organize a tree plantation drive in and around the college campus and adopt a sapling each in the college premises and in their neighborhood to take care of.
- Any other Practical/Practice as decided from time to time

SUGGESTED READINGS:

1. Akhter, Tawhida, and Ahmad Bhat, Tariq. Literature and Nature. United Kingdom, Cambridge Scholars Publishing, 2022.

2. Shiva, Vandana. 'Development, Ecology and Women', Staying Alive: Women Ecology and Development. India: Zed Books, 1988. pp 1-14

3. Carl, Safina. Prologue & Chapter 1, Beyond Words: What animals think and feel. Souvenir Press, 2015.

. Garrard, Greg. *Ecocriticism*. United Kingdom: Taylor & Francis, 2011.

5. Wohlleben, Peter. *The Hidden Life of Trees: What They Feel, How They Communicate—Discoveries from a Secret World*. India: Penguin Books Limited, 2016.

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Course Title - Ethics and Culture

Course Objectives

- The course aims to help students explore ethical and cultural dimensions of their lives.
- The course provides a forum for students to pause, revisit their assumptions and beliefs, and become mindful of their thoughts, emotions and actions.
- It gives the students an opportunity to express themselves and inquire into their decision making processes. This will enable them to cultivate ethical values and participate in the creation of a society based on acceptance, compassion, and justice.

Learning Outcomes

- Explore perspectives on ethics in thoughts, words and actions
- Evolve ethical decision making practises
- Understand the need for an ethical society and culture
- Introspect, become conscious of and assess one's stance in life
- Cultivate empathy, tolerance and compassion
- Apply the values learnt in the course to everyday life.

Syllabus of *Ethics and Culture*

Unit 1

Unit I: Introduction | The Basis of Ethics
• Getting to Know Each Other • What to Expect from the Course? • Recognition of Our Common Humanity • Empathy, Compassion and Justice
Unit II: The Role of Intelligence, Reason and Emotions
• Discernment: What Is The Right Thing To Do? • The Art of Conflict Resolution • Destructive and Constructive Emotions • The Need for Emotional Balance
Unit III: Cultivating Inner Values | Ethics in the World of Work and Play
• Training the Mind: Mindfulness and Kindness • Meditation • Discovering your Vocation and Interests • Self-discipline, Integrity, Commitment, Creativity • Work-Life Balance
Unit IV: Striving for a Better World | Outreach Activities
• Means and Ends • Debate and Dialogue • Culture as Shared Values • Creating and Sustaining Ethical Cultures: The Role of Philosophy, Religion, Literature, Theatre, Cinema, Music, Media

Practical/ Practice Component
Unit 1

1. The teacher may ask students to introduce themselves, sharing their regional and cultural roots. They may be asked to reflect on those aspects of their identities that reflect their cultural roots.
2. After a round of initial introduction, the teacher may ask students to list down a set of values that they think they have developed through their parents and grandparents. Are these values unique to their families, regional and/or ethnic backgrounds? Of these, which are the values they would like to sustain and which are the ones they would wish to modify?
3. The teacher may draw upon the values discussed by students in the previous lesson. Using these as the base, the teacher may ask students to think of ethical values that form the basis of their decisions.

4. The teacher may ask students to think of people who they think have lived an 'ethical life'. These may be people who they know from their personal lives or people known for upholding ethical values in the face of adversity.
5. Students are encouraged to identify what are common human values necessary to realise shared common humanity–the feeling of interconnectedness/interdependence.
6. Class to be divided in small groups to discuss how each would make an effort to cultivate new morals/ethical values for betterment of their local environment.
7. Celebrating 'Sharing and Caring' based on regional diversity can be encouraged.
8. Engage students to do activities of 'being in the shoes of others' (peers, parents, siblings, house help/support or in any local community grappling with problems) to understand the problems empathetically.
9. The students can be asked to make bookmarks/cards to remind them about virtues pertaining to empathy versus sympathy, need versus greed, just versus unjust or compassion versus insensitivity.
10. Compassion is about cultivation of it as a daily value so students can in small groups undertake compassion based activities of looking after animals, birds, needy, elderly, differently abled, non-privileged etc. and share their thoughts in the class.

Unit 2

1. Make the student think of a hard decision they have made. What made it hard? How did you make the decision? How do you assess it retrospectively?
2. Encourage students to think of judgements and decisions based on the dilemmas and challenges they faced? How do they go about making these decisions?
3. The teacher may introduce any well known story and ask the students to discuss the story from the point of view of the different characters.
4. Ask students how willing they are to deal with a conflict when it occurs. What strategies do they adopt to resolve the conflict?
5. The teacher may ask students to prepare posters with captions like "avoidance", "competition", "cooperation" and "adaptation" and then may ask students to identify with one of these styles which according to them best represents their style of dealing with conflict.
6. The students may be asked to discuss different such similar situations that they may have encountered and a discussion may be initiated on how they resolve those conflicts.
7. The students can be asked to write down certain destructive emotions that they are experiencing presently. How would they work to make them constructive? A classroom discussion could follow around this.
8. Ask the students to note down a list of constructive emotions experienced by them

recently. Were the constructive emotions less powerful as compared to the destructive ones experienced by them? Discussion in class can follow.

9. How do you (i) express, (ii) handle anger/ disgust/ distress/ fear (any destructive emotion can be taken up). A healthy discussion in the class can take place around this.
10. Students may be asked to practice a simple breathing exercise. They can sit straight with eyes opened or closed in a comfortable position to just observe their breathing. They can repeat this exercise six to eight times and share (if they like) their experience of silence.
11. To identify your interests and develop a meaningful hobby.
12. Have an open conversation in the class about happiness.

Unit 3

1. The students could observe various emotions that bottle-up in their minds and be asked to watch the flow of emotions non-judgmentally.
2. Students may be asked to recall their journey to the college that morning. Do they remember road signs, faces of people they crossed, the roads that they took, the people they interacted with, the sights and smells around them, or anything else?
3. Students could be asked to cultivate the habit of simple greeting as practice of gratitude and celebrate a day of joyful giving.
4. The students can close their eyes for 2-3 minutes and be asked to observe their thoughts, list them and categorise them into 'to be kept' or 'to let go'.
5. The teacher may ask students to close their eyes and imagine a situation in which they are truly happy. Students could wish for the well-being of two students in the same classroom in their meditative state.
6. Students could meditate on who has been their inspiration and the qualities of the person who has inspired them and then express gratitude to the person concerned.
7. The teacher may ask the students to think retrospectively about what they thought they would take up as a vocation when they were younger. How and why their choices were influenced and changed, if at all.
8. The teacher may ask the students to imagine and chart a journey and destination for themselves. They may also talk about the challenges they foresee.
9. The teacher may encourage the students to maintain a daily diary of their scheduling of time or a worklog and see how much time they effectively give to their work. The teacher may help the students identify the distractors and where one may be 'wasting' time and energy. The activity is designed to help students understand the value of effective time utilisation.
10. In this lesson, the teacher may ask the students to draw up a list of team ethics. They may build this based on their experiences of working with each other in groups.

11. The teacher may ask the students to share an incident each where they felt pressurised/bored to complete some work. How did they deal with their stress and monotony of work?

Unit 4

1. Students will be asked to work in pairs and develop situations that pose ethical dilemmas and how to resolve them.
2. Students may be asked to look at a film or at an advertisement and discuss what they think about the question/s posed in them. The teacher may ask them if they can think of an alternative ethical approach to the problem posed.
3. Students will be asked to think of situations in which they lost their temper. Have they ever felt that in a fit of emotion they said something that they regretted later? If they had paused to listen and then respond, what would the other person have said? How would the outcome of the situation have been different?
4. A debate on any relevant topic may be conducted in the class. After the first round the students may be asked to adopt and argue their opponents point of view. At the end of this exercise the students can have an open discussion on which position finally appealed to them.
5. The teacher may give a short story to the students and ask them to change the ending. They may be asked to observe how characters and their views may have undergone change in the process.
6. There can be a discussion around a topic such as, the idea of corporal punishment, euthanasia etc. Students can be given a sheet of paper and can be asked to write for or against the theme. The idea is to enable them to understand that the positions they have taken vis-a-vis the theme are a result of different value orientations.
7. Popular foods from many parts of India can be discussed. Their origins can be traced to chart a kind of food history.
8. The teacher on the basis of discussions with students can draw from Philosophy, Religion, Literature, Theatre, Cinema, and Media to highlight that the choices people/characters make are grounded in their culture.
9. The students can discuss classical/folkdances that are performed in their respective groups. Details can be drawn based on the number of dancers, music (live or recorded) and costumes. The role of oral traditions and literature in indicating the importance of ethics in our everyday lives can be discussed.

Suggested Activities for Outreach: Social/ Community Engagement and Service

In the weeks that follow, students will be expected to engage in outreach activities that shall enable them to put into practice some of the ethical considerations deliberated upon and imbibed in the previous modules. A list of suggested outreach activities is as follows:

- Adopt a village with the aim of cultural and ethical learning
- Discussing health and hygiene issues in a community
- Tutoring students Gender sensitization
- Working on environmental issues
- Working with Child Care Centre such as Anganwadis and Balwadis
- Working with differently abled students
- Preserving cultural and heritage sites
- Spending time with senior citizen including a Senior Citizens Home
- Extending care to animals in animal welfare shelters
- Addressing issues relating to Reproductive Health
- Spreading awareness about adolescent health
- Addressing issues relating to mental health
- Health and nutrition awareness
- Swacchata Abhiyaan
- Sensitisation towards disease awareness
- Vriksharopan

If required, students can share their experiences in the form of a Project Report

Any other Practical/Practice as decided from time to time

Suggested Readings:

- Aristotle. *Nichomachean Ethics*. London: Penguin Classics, 2004
- Swami Vivekananda. *The Complete Works of Swami Vivekananda*. Advaita Ashrama, 2016.

  ---https://www.ramakrishnavivekananda.info/vivekananda/complete_works.html
- Panch Parmeshwar in English translation as The Holy Panchayat by Munshi Premchand
- The Silas Marner by George Eliot
- We are Seven by Wordsworth
- The Chimney Sweeper by William Blake

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Coures Title - Ethics and Values in Ancient Indian Traditions

COURSE OBJECTIVES:

- To understand the rich cultural traditions relating to discourses on life and its purpose, instilling of values relating to ethical and moral propriety.
- To make students more engaged with the past traditions of the country.
- To introduce students to early epics: Puranic, Buddhist and other traditions.

LEARNING OUTCOMES:

- Students will develop an overview of indigenous philosophies.
- Understanding the richness of Indian heritage leading to greater sensitivity.
- Inspiration from history to deal with contemporary issues.
- Appreciate the traditions of diversity, discussions, debates and knowledge transmission.

Syllabus of *Ethics and Values in Ancient Indian Traditions*

Unit I The idea of India and Bharat
1. 'Jambudvipa'; 'Aryavrata'; 'Bharat' ; India 2. Early discourse on moral order- ṛta in Vedic traditions 3. Debates in the Upanishads and the Shramanic traditions
Unit II State, Society and Dharma
1. Kingship and Society: *Dharma, Neeti* and *Daṇḍa* 2. Rashtra, Sanskar and making of socio-cultural milieu
Unit III The 'Purpose of Life' in Texts
1. 'Right Conduct': Buddhist, Jaina and Shramanic Traditions 2. Puruṣārtha Chatushtaya*: Dharma, Artha, Kāma and Mokṣa* 3. Assimilation and Assertion: Ethical issues in Epics and Puranic traditions

Practical/ Practice Component

- Discuss in your locality, in 10-15 households with regard to Ethics and Values in Indian traditions:
  - Vedic traditions
  - Puruṣārtha Chatushtaya
  - Buddhist, Jaina and Shramanic Traditions
  - Jambudvipa; Aryavrata; Bharat; India
- Students are required to explore e-resources available with University of Delhi and other academic institutions.

- Students are required to watch documentaries and films on the subject-related topics.
- If required, students can share their experiences in the form of a Project Report.
- Students may share their experiences in the form of audio-visual presentations of 15-30 minutes.
- Any other Practical/Practice as decided from time to time

Essential Readings

Buietenen, J.A.B. Van, *The Bhagwadgita in the Mahabharata: Text and Translation.* Chicago: Chicago University Press, 1981. Bhagwadgita by Geeta Press Gorakhpur.

Bhasham, A.L, *Wonder that was India: A Survey of the Culture of the Indian Subcontinent Before the Coming of the Muslims.* London, Sidgwick and Jackson, 1954

Dasgupta, S. N. *History of Indian Philosophy*. Cambridge University Press, 1923, Vol. I-II.

Hiltebeital, Alf. *Rethinking the Mahabharata: A Reader's Guide to the Education of the Dharma King.* Chicago: Chicago University Press, 2001.

Kane, P.V. *History of Dharmashastra (Ancient and Medieval Religious and Civil Law),* vol. II, parts 1-2; vol. III 3rd ed. Pune: Bhandarkar Oriental Research Institute,[1941, 1946].

Olivelle, Patric. King, Governance, and Law in Ancient India: Kautilya's Arthashastra. Oxford: Oxford University Press, 2013.

Sharma, Arvind. 'On Hindu, Hindustan, Hinduism and Hindutva'. Numen, 49(1), 2002, p. 1-36.

Suggested Readings

Olivelle, Patric. (text and trans.) *Manu's Code of Law: A Critical Edition and Translation of the Manava-Dharmashastra.* New Delhi: Oxford University Press, 2006.

Rocher, Ludo. 'The Concept of Boundaries in Classical India', in Peter Gaefkke and David A. Utz (eds.), *The Countries of South Asia: Boundries, Extensions, and Interrelations*

Philadelphia: University of Pennsylvania, Department of South Asia Regional Studies (Proceedings of The South Asia Seminar, III, 1982-1983), 1988, p. 3-10.

Sukthankar, V.S., S.K. Belvalkar, and P.L. Vaidya(ed.). *The Mahabharata.* Poona: Bhandarkar Oriental Research Institute, 1933-66.

Tripathi, Radhavallabh, ed. *India's Intellectual Traditions: A Revealed Through Sanskrit Sources*. New Delhi: Sahitya Akademi, 2016.

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Coruse Title - Financial Literacy

Course Objectives

- Familiarity with different aspects of financial literacy such as savings, investment, taxation, and insurance
- Understand the relevance and process of financial planning
- Promote financial well-being Learning Outcomes
- Develop proficiency for personal and family financial planning
- Apply the concept of investment planning
- Ability to analyse banking and insurance products
- Personal tax planning

Syllabus of *Financial Literacy*
Unit I: Financial Planning and Financial products
• Introduction to Saving • Time value of money • Management of spending and financial discipline
Unit II: Banking and Digital Payment
• Banking products and services • Digitisation of financial transactions: Debit Cards (ATM Cards) and Credit Cards. Net banking and UPI, digital wallets • Security and precautions against Ponzi schemes and online frauds
Unit III: Investment Planning and Management
• Investment opportunity and financial products • Insurance Planning: Life and non-life including medical insurance schemes
Unit IV: Personal Tax
• Introduction to basic Tax Structure in India for personal taxation • Aspects of Personal tax planning • Exemptions and deductions for individuals • e-filing

Practical/ Practice Component

- Regular class activities to enhance students' understanding of topics and the application of concepts. The case study method may be followed as a teaching pedagogy.
- Numerical questions pertaining to each unit wherever applicable should be practiced.
- For the second unit, students may be assigned a project wherein they can log on to the website of various banks and conduct an in-depth analysis and comparison of various financial products offered.
- For Unit III, a Project related to building a dummy portfolio of stocks and tracking their returns may be given.

- An investment budget may be given to the students to select investment options that maximize the return and minimize the tax implications.
- For the last unit, students may also file a dummy IT return to get hands-on experience with e-filing.
- Students may conduct a financial literacy survey among at least 25 respondents to measure the level of financial literacy and share the findings in the awareness in the form of a report.
- Any other Practical/Practice as decided from time to time

References

- *Introduction to Financial Planning (4th Edition 2017)* – Indian Institute of Banking & Finance.
- Sinha, Madhu. *Financial Planning: A Ready Reckoner July 2017,* McGraw Hill.

Additional Resources

- Halan, Monika. *Lets Talk Money: You've Worked Hard for It, Now Make It Work for You* July 2018 Harper Business.
- Pandit, Amar *The Only Financial Planning Book that You Will Ever Need* , Network 18 Publications Ltd.

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Course Title - Fit India

Course Objectives:

- Encourage physical activity through engaging the students in sports and yoga.
- Understand the importance of a balanced diet .
- Build skills for self-discipline, self-confidence, cooperation and teamwork.
- Promote fitness as a joyful activity.

Learning Outcomes:

- Adopting a healthy lifestyle.
- Knowledge of nutrition, diet and psycho-physiological aspects of fitness.
- Develop Self-esteem, Self-confidence, Self-discipline and team spirit as indicators of fitness.

Syllabus of *Fit India*
Unit I: Participation in Physical Activity • Fit India Protocol • Physical Activity, Health and Fitness • Indicators of Fitness Practical/Practice • Aerobic Work Out / Physical Activity (Walking) • Yoga – Asanas (Lying, Sitting and Standing positions) and Pranayama • Cardiovascular Testing by 12min/9 min Cooper Run/Walk test
Unit II: Health Related Fitness and their Components • Muscular Strength and Endurance • Body Composition and Flexibility Practical/Practice • Flexibility Training: Back Saver Sit and Reach test • Muscular Strength Training: Curl Ups / Standing Broad Jump/ VerticalJump/ Plyometric • Endurance Training: 1 Mile RockPort Testor 12 /9 minute Cooper run/walk test. • Ideal Body Weight,Body Mass Index (BMI), Waist-Hip Ratio, Waist-Height Ratio (Data of at least 10 persons to be collected)

Unit III: Nutrition and Fitness

- Healthy Eating Plate
- Balanced Diet
- Caloric Content of Food

Practical/Practice

- Preparing Daily Diet and Calorie Chart
- Aerobic Work Out / Physical Activity (Walking)
- Assessment of Physical Activity with the Calorie intake.
- Asanas for :
  - digestive system
  - excretory system

Unit IV: Psycho-physiological aspects of Fitness

- Sports Physiology and Psychology
- Depression, Anxiety and Stress Scale (DASS)
- Rosenberg Self Esteem Scale

Practical/Practice

- Skills learning and Participation in sports
- Group Games / Relays/ Minor Games
- Meditative Asanas and Pranayama
- Fitness component testing (as per Fit India Protocol and Norms) and Analysis of Results
- Data of at least 10 persons to be collected on DASS and self-esteem scale

Note: Concepts are to be taken up during the practical/practice hours.

Essential Readings:

- Fit India Website: https://fitindia.gov.in
- Wener W.K. Hoeger, Sharon
- A. Hoeger - Fitness and Wellness-Cengage Learning (2014).

SUGGESTED READINGS:

- Charles B. Corbin, Gregory J Welk, William R Corbin, Karen A Welk Concepts of Fitness And Wellness_ A Comprehensive Lifestyle Approach-McGraw-Hill (2015)
- W.Larry Kenney, Jack H. Wilmore, Devid L.Costil(2015). Physiology of Sports and Exercise, Second Edition. USA. Human Kinetics.
- Websites of International Sports Federations
- Website of Ministry of Youth Affairs and Sports

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Course Title - GANDHI AND EDUCATION

Course Objectives

1. Seek inspiration from Gandhi's thoughts on education.
2. Analyse Gandhian education philosophy for moral and character development.
3. Understand Gandhi's Idea on Self-reliant education (Swavalambi Shiksha)
4. Relate Gandhi's educational thoughts to NEP 2020

Learning Outcomes

1. Value Gandhian perspective on education
2. Appreciate the significance of education in Indian languages
3. Evaluate the application of Gandhian thoughts in NEP 2020
4. Realise the principles of NEP 2020 in vocational and skill oriented education.

Unit I: Gandhi's Philosophy and education
• Gandhi's Philosophy on education • Education for character building and moral development • Education relating to health, hygiene, heritage, and handicraft
Unit II: Gandhi's Experiment in Education
• Gandhi's educational ideas on use of Indian Language as a medium of Instruction, TextBook and Teacher. • Gandhi's educational thought on Elementary and Adult Education. • Gandhi's vision on Higher Education
Unit III: Gandhi's Educational Thought on Skill and Vocational Education • Rural development through Skill and Local Need Based education • Skill education in NEP 2020 and Gandhi • Gandhi's Idea on Self-reliance (Swavalambi Shiksha) and its reflection in contemporary educational policy.

Practical/ Practice Component

- Regular visits to Gandhi Museum and library to gain insight on Gandhi
- Excursion to Gandhi Ashrams located in different places like Sewagram, Wardha, Sabarmati, Ahmedabad etc.
- Workshops/projects in collaboration with Gandhi Bhawan, Gandhi Smriti and Darshan, Gandhi Peace Center. Ashrams based on innovation in village & cottage industry, Khadi, handicrafts, organic farming etc.
- Adoption of one place for Swachhta Mission or Skill Education
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

ESSENTIAL READINGS

• महात्मा गांधी. (2014). बनिु यादी शिक्षा. वाराणसी : सर्वसेवा संघ प्रकाशन.

• गांधी, मो. क. (2010). मेरेसपनों का भारत. अहमदाबाद : नवजीवन प्रकाशन मंदिर. नवजीवन प्रकाशन मंदिर. (1960). शरीर-

श्रम. अहमदाबादः मो. क. गांधी. pp– 196-231

• प्रभ, ुआर. के. व राव, य. ुआर. (1994). महात्मा गांधी के विचार. इंडिया: नेशनल बकु ट्रस्ट.

• Anand T. Hingorani, ed.] Gandhi, M.K. Our Language Problem (Bombay:

• Bharatiya Vidya Bhavan,), pp. 53-55

• TOWARDS NEW EDUCATION written by M. K. Gandhi Edited by Bharatan Kumarappa

SUGGESTED READINGS:

- गांधी, मो.क. (2012). स य के योग अथवा आ मकथा (वेद , काशीनाथ,अनवु ादक) अहमदाबाद: नवजीवन काशन मं दर.
- गांधी, मो.क. (2012). हदं वराज (नणावती, अमतलालृ ठाकोरदास, अनवु ादक). अहमदाबाद.नवजीवन काशन मं दर
- Coomaraswamy, Anand K . (1910). Art and Swadeshi . Munshi Ram Manoharalal. Delhi

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Course Title - Panchakosha: Holistic Development of Personality

Course Objectives

- To introduce Five *Koshas* – five levels of mind-body complex – *Annamaya, Pranayama, Manomaya, Vigyanamaya* and *Anandamaya Kosha*; for a holistic development of personality.
- To generate awareness about physical and mental wellbeing through the Indian concept of *Panchkosha*.
- To develop a positive attitude towards self, family and society amongst students.
- To guide students build personalities based on the understanding of *Panchkosha*.

Learning Outcomes

- Enhanced physical and mental health.
- Coping with peer pressures and stress.
- Improved concentration leading to better overall performance.
- Manage life situations through a balanced and mature approach.

Syllabus of *Panchkosha: Holistic Development of Personality*

Unit I: Elements of Personality
• *PanchaKosha*: Introduction • Five aspects of Human Personality: *Annamaya Kosha* (Physical body), *Pranamaya Kosha* (Vital life force energy), *Manomaya Kosha* (Psychological wellness), *Vijnanamaya Kosha* (Intellect), *Anandamaya Kosha* (Happiness and Blissfulness) • Health: Mental and Physical
Unit II: *Annamaya Kosha* and *Pranamaya Kosha*
• Human Body and *Pancha Karmendriyas* • *Annamaya Kosha:* Balanced diet and exercise for healthy body • *Pranamaya Kosha:* Development of life force, *Pranayam* • *Charucharya:* Social Etiquettes
Unit III: *Manomaya Kosha* and *Vijnanamaya Kosha*
• *Antahkarana* and its functions • *Pancha Gyanendriyas* • *Manomaya Kosha* : Controlling the *Mana* (mind) • *Vijnanamaya Kosha*: Ability of discretion and decision making
Unit IV: *Anandamaya Kosha* and Beyond
• *Anandamaya Kosha:* Experience of happiness and bliss • Self-realisation, Nature of Consciousness: *Sat-Chit-Ananda*

Practical/ Practice Component

- Recitation of select verses from *Taitiriyopansid*
- *Asana*
- *Pranayama*
- Meditation
- Visit to a Yog shivir or meditation centres
- Students are required to watch documentaries and films on the subject-related topics.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

Essential Readings

- पंचकोश विवेक,स्वामी परमहंस योगनान्द, https://ndl.iitkgp.ac.in/पर उपलब्ध
- विवेक चड़ामू णि, आदि शंकराचार्यद्वारा लिखित, अरविन्द आनंद द्वारा अनदि त, चौखम्भा प्रकाशन, वाराणसी, 2015
- Vivek Chudamani, Adi Shankaracharya, Swami Turiyananda (Sanskrit and English), Sri Ramakrishna Math, Mylapore, 2019
- सभी के लिए योग,बी.के.एस. आयंगार, प्रभात प्रकाशन, 2018
- Yoga The Path to Holistic Health: The Definitive Step-by-step Guide, B.K.S. Iyengar, Dorling Kingsley, London, 2021
- The Sacred Science of Yoga & The Five Koshas, Christopher Sartain, CreateSpace Independent Pub, 2015 Suggested Readings
- PanchaKosha: The five sheaths of the human being, Swami Nishchalanand, Kindle edition.
- Upanisadvakya Mahakosa. (An Upanishadic Concordance, taken from 239 Upanishads, G. S. Sadhale (Compiled by). Chowkhamba Vidyabhawan, Varanasi, 2014
- The Pentagon of Creation: As Expounded in the Upanishads, Ajai Kumar Chhawchharia, CreateSpace Independent Pub, 2015

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Course Title - Social and Emotional Learning

Course Objectives

- This course aims to develop social and emotional awareness in students and initiate them towards better personal and social well-being.
- To create an awareness towards self, others, the environment and their harmonious coexistence.

Learning Outcomes

- Students will be able to become aware of oneself and the society.
- Make informed lifestyle choices and extend the self in the joy of giving.
- Develop empathy, compassion, connect with nature and evolve emotionally to create a more harmonious society.
- Cultivate sensitivity towards discriminatory practices and explore possible solutions.

Syllabus of *Social and Emotional Learning*
Unit I: **Introduction | Self-Awareness and Happiness**
• Getting to Know Each Other • What to Expect from this Course? • Getting to Know Oneself • What Makes One Happy/ Unhappy? Outer vs Inner Sources of Happiness, Joy of Giving
Unit II: Social Relationships | Mindfulness
• Sharing vs Power: Peers, Family and Society • Going Beyond Power Relationships Through Open Conversation • The Value of Silence and Reflection • Practice of Mindfulness
Unit III: **Identity, Self-Image, Status, Self-Worth | Digital Identity**
• Identity Construction and Expression: Individual and Collective • Accepting and Valuing Oneself • Understanding the Gendered World • Identifying and transcending stereotypes • Identity Formation and Validation in the Digital World • Discrimination and its Forms

Unit IV : **Lifestyle Choices | Stress and Its Management**
• What Choices Does One Get To Make? • Is Choice influenced? Relationships, Career Choices • Career Pressures, Examinations • Dealing with Disappointment, Coping Skills, Health and Fitness • Connect With Nature: Sensitivity Towards Other Sentient Beings

Practical/ Practice Component
Unit 1

Getting to Know Each Other

In this lecture, the teacher will facilitate social engagement and personal reflection through a round of introductions. This also provides an opportunity for the teacher and students to recognise the deeper meanings that lie underneath routine exercises of introduction. For example, the adjectives that people use to describe themselves are indicative of the image that they wish others to hold of them. But do they hold the same image about themselves?

Teachers may begin the class by introducing themselves. Any introductory exercise that serves as an ice breaker and creates the classroom space as one of vibrant and open discussions, may be used. Teachers should try and ensure participation of all students in this exercise.

Activities

1.Who is in your circle?

Students may be asked to draw three concentric circles on their notebooks. The central circle is for the topic, the second for 'Love', and third for 'Like'. The space outside the circles is for 'Don't like'. The class decides on one topic, such as food, movies, web series, books, music, interests, etc. Each topic is taken up in turn and students are asked to write what they love, like, and don't like in the circles and share it with others. The exercise helps students to identify with their peers in commonalities and differences. The teacher may use prompts such as 'Why do you like this show?', 'Why do you dislike this food?' etc.

2. I am...

Students are asked to complete the sentences. The teacher may take turns and ask random students to answer it or the teacher may write these on the board and ask every student to write the answer in their notebooks. Some suggested prompt sentences are:

I am excited about.....

I wish I could.....

I am wondering.....

I am feeling anxious about....

Students can choose to share some of the answers with the class. The purpose of the exercise is to bring most students to speak in class and share their honest feelings and thoughts.

3. Introduce Yourself... Know Yourself

In this exercise, the teacher asks all students to take turns to introduce themselves. It is likely that most students will talk about their names, previous qualifications and hobbies. At the end of the introductions, the teacher can identify commonalities such as previous courses undertaken, regional identities, age, or similar common factors. The teacher may then use the following prompts to facilitate discussion:

Do these define you? Are you something more?

Would you like to change any of these qualifiers?

Is there something about you that you would like to share with us? Do you ever wonder about your identity/ identities?

What to Expect from this Course?

In this class, the focus is on understanding the relevance of the course and providing a course overview. Students will be able to explore the various dimensions of their lives and develop insights about themselves and their relationships. By discussing the outline of the course and the suggested activities, the teacher shall bring to the fore the exploratory journey that the students will embark upon. The students' questions relating to the course contents will also be addressed in this lecture.

Activities

In this class, the teacher may undertake an overview of the course, discussing each week's themes briefly. The nature of assignments and evaluation can also be detailed out. The teacher may hold a discussion with students on the following:

1. Why is social and emotional learning important?
2. What can the teacher do to make the classroom a more welcoming and open space for you?
3. What would be some of the activities that you would like to undertake during the course? Such
   as watching movies, reading books, maintaining a reflective journal, engagement in the field, mindfulness exercises, etc.

Self Awareness and Happiness

The aim of this module is to help students develop awareness about themselves – who they are, what their strengths and limitations are, and how they can develop themselves. This will help them to learn interlinkages and distinctions between thoughts, emotions and behaviours. This module will make them aware of the difference between happiness and pleasure and help them ponder on sources of happiness.

Self Awareness

Self-awareness is the experience and understanding of one's own personality – how an individual understands his own feelings, motives, desires, and behaviour, and the triggers for the same. Hence, self-awareness can be considered to be vital for personal development.

Students would thereby become more grounded and confident. This lesson will focus on the student's intrapersonal and interpersonal awareness through discussions and activities.

Activities

1. Students are asked to make a timeline of important events in their life and how each one affected them at that time. Do they see it differently today?
2. SWOT Analysis can be done by each student – Strengths, Weaknesses, Opportunities and Threats.
3. How do they envision their ideal person – What does your ideal person look like? What characteristics do they possess? Identify the gap. How do they plan to fill/reduce the gap?

Happiness

The term 'happiness' includes pleasant and positive emotions which can range from deep satisfaction and contentment to pleasure and excitement. The focus of this session would be to discuss techniques to develop the long-lasting feelings of contentment rather than momentary and short-lived emotions of excitement and pleasure. This will encourage and foster feelings of wellbeing and life satisfaction. The teacher will use activities in order to inculcate the ways of developing and sustaining happiness.

Activities

Writing a gratitude Journal – include in it what you are grateful for.

Mindfulness exercises and developing a mindful way of doing things.

"As one door closes, another door opens". A discussion based on the three opportunities that they think they lost and consider what it was they gained in the process.

Unit 2

Social Relationships

In this module, students will be asked to turn their gaze towards the society in which they are located and where they form social relations. They will be asked to introspect and understand the ways in which they connect with their immediate and extended social surroundings. In this context, peers and family exercise a significant influence on the identities of adolescents and young adults. The students will be asked to assess the nature of their relationship with friends and family and explore these negotiations in the context of sharing versus power.
The teacher will help students broaden their understanding by extending the discussion to include other social relationships, beyond peers and family. They will be encouraged to think about how they are influenced and how they in turn influence the people around them. The class shall explore the importance of open conversation as a means to resolve conflicts and contradictions.

Sharing vs Power: Peers

Identity formation and development is significantly dependent on the peer group with which the individual interacts. During this class, the students may pose the following question to themselves and to each other- What is the nature of the relationships that they share with their peers? Adolescents and young adults like to conform to peer expectations. Students may

explore whether relationships between peers are equal. What forces mediate these relationships? By posing examples from real life, the teacher will encourage the students to closely examine their relationships with their friends and family.

Activities

Ask the students to describe their close friends with fictitious names. They should then be asked why they are close to them and what is the one quality about their friends that they appreciate.

Divide students into groups of 5 each. This can vary depending on the class size. Each group can discuss how they were influenced by their friends in decision making processes.

The class/ group can share a story from their life about how they made a decision based on peer pressure. They should also share the result. Were they happy or unhappy about it? The findings can be discussed in the class.

Sharing vs Power: Family

The family is often considered to be a given and stable construct in which one is born or placed. As the relationships of adolescents with people outside the home grow, their interactions with their families evolve and take on a new and sometimes difficult character. Discussions and activities in the class should help the students objectively analyse their family space and the way in which they negotiate with it at different points of time. Through examples from day to day life, the teacher will help the students understand such spaces and the role they play.

Activities

Describe the ideal family. The students can think about the nature of the ideal created by them. What is the role played by siblings in your personal development?

Role play can be used to perform the different roles in a family so as to understand the different points of view within it.

Sharing vs Power: Society

The individuals generally extend the nature of their relationships with the family to the larger social world. In their pursuit to seek autonomy and independence, they may form new kinds of relationships in the larger social context. These relationships may be characterised by imbalances in power. This lecture will try to help the students strike a balance between self and society and stress the role of dialogue, sharing and cooperation.

Activities

The teacher can ask the students to describe any one constructive social role performed by them. (Any way in which they helped people around them). They can draw, speak, share a photograph or write a creative piece about it.

In the years to come what kind of role do you see yourself performing in society?

Share any one story about a person that has really influenced you? It can be about a public figure or anyone around you.

Going Beyond Power Through Open Conversation

In the previous lectures, the discussion has been around family, peer groups and society. In this session, the focus will be on the ways to build a more egalitarian society—one that is more collaborative, inclusive and takes into account different points of view. Open Conversation is suggested as a way by which acceptance, active listening and empathy can be

encouraged.

Activities

The students can be asked to present a brief performance showing the way in which open conversation can help in conflict resolution.

Movies in line with classroom discussions held in the past few weeks can be shown to the students. Movie screening should be followed by a discussion.

A short story, poem or a play can be used to build on classroom discussions.

Mindfulness

This module focuses on the significance of silence, introspection and non- judgmental awareness of the present moment. These mental practices are for understanding and building humane connection with self and others. The students are sometimes unable to spare time for their inner growth. Mindfulness practices aim at self-awareness and self- acceptance for overall well being. Valuing and practicing silence helps in the process of deeper reflection and builds inner strength to face conflicts with calmness. It hones the ability to develop mental equanimity and equipoise.

The Value of Silence and Reflection

The students will learn to understand the value of silence in the noise around. The practice of silence helps in self-reflection and connecting the inner and outer worlds. It enables one to experience joy, contentment and peace. Silence is a way of understanding how to enjoy one's own company and not to confuse being alone with loneliness. The students will appreciate that silence and solitude are positive and constructive.

Activities

The students can be asked to maintain silence and watch the flow of thoughts and emotions. In the process of silence the students can identify what gives them happiness and what they can do to create happiness for others.

The students can visit natural spaces to understand how silence runs in the sounds of nature which can help them realise peace.

Practice of Mindfulness

Through this lesson, the students will understand the significance of mindfulness as a daily practice for understanding that happiness depends on the self-training of mind. The joy of living in the moment with full awareness and steadiness of mind are important for accepting and cherishing all experiences positively and non-judgmentally.

Suggested Activities

Mindful walk/trek in the garden/forest/mountains or at a monument. Mindful eating while enjoying all elements of tastes in different types of food can also be done.

The students can be engaged in groups for non-judgmental listening

The class can be divided to discuss what activities of the day they engage with full awareness and where the moments go unnoticed

Identity, Self-image, Status, Self-worth

The module is designed to help the learners revisit the constructs of identity, self and personhood. It builds on questions such as 'who am I', 'how do others and I see myself', 'does status and self-image affect my sense of self-worth'. Specifically, it deals with how one's identity takes shape and thereon begins to be an integral part of oneself. It encourages the students to think about what factors influence their self-worth, such as achievements and accumulations, wealth, career or popularity. The students learn to accept and appreciate self and others.

Identity Construction and Expression: Individual and Collective

This lesson is aimed to help the learners deconstruct their sense of identity and rechart the signifiers/ markers and processes which have played a pivotal role in constructing their sense of identity and self. Itunfoldshowprocessesofsocialisationwithinfamily,school,community and society at large have played a role in making students who they are. How do these processes shape our notions of self-concept, self-evaluation, and self-esteem? The students will be able to become aware of their individual and collective sense of identity and self.

Activities

The teacher may ask the students to imagine one's identity in different contexts that are significant for identity construction. For instance, what does identity of being someone's 'child' entail; likewise what kind of an identity does one expect of oneself as a sibling, student and as a friend.

The teacher may ask the students to read from biographies/autobiographies of people from other cultures and discuss excerpts from the books. The teacher may elaborate the qualities of these people.

The teacher may organise a field visit with the students to different places. Ask the students to survey people from those locales about their experiences.

Accepting and Valuing Oneself

This lesson builds on the previous lesson by unpacking how concerns revolving around self-image and status may affect one's sense of self. It aims to make one aware why a challenge to one's identity may lead to discomfort and conflict. Students will be encouraged to accept their physical appearance and identity and to value self-worth. This lesson invites them to undertake an inward journey.

Activities

The teacher may ask students to respond to different characters in a movie where challenges to their identity lead to different kinds of responses.

What will change after 10 years in terms of your identity and what according to you will not change?

The teacher may ask the students to identify an 'open space' and 'sit alone' and write a reflective essay on the theme, 'remember what makes you, you'.

Gender Roles

The objective of this module is to enable the students to differentiate between biological and psychological context of gender in order to understand how their gendered identities are socially constructed. Gender refers to the characteristics of men and women and includes norms, behaviour and roles associated with being man or woman, girl or boy. Further, this will enable the students to become aware that their destiny need not be determined by biology.

Understanding a Gendered World

The objective of this lecture is to enable the students to understand that gender roles are taught by the process of socialization, beginning with the family. Everyday things that we do like eating, speaking, walking, our gestures and even the professions that we think we choose are all often influenced by societal norms.

Activities

The teacher may ask the students to list things associated under the heading; men and women. Once listed, the headings can be interchanged and a discussion may follow.

Ask students to bring an artefact from home, it can be a childhood picture.On the basis of the picture students can share childhood experiences. Through the narrative of their oral history students can share experiences of how they acquired gender.

Identifying and Transcending Stereotypes

In the previous lecture, students have been made aware that gender stereotypes are socially constructed, that the ways in which we interact with others and with ourselves are shaped by gender. The objective of this lecture is to explain the importance of thinking beyond the stereotypes and to reinforce that biological differences between genders should not lead to social discrimination.

Activities

Movie viewing: Students and teachers can choose any movie for discussion.
Quiz cards: On the cards the following can be written and the student can be asked to identify which is socially constructed and which refers to biology.

Men are Breadwinners, Women are homemakers.

Males have XY chromosomes, Females have XX chromosomes.

Women give birth to babies, men don't.

Boys don't cry

Digital Identity

It may be constricting to identify exclusively with ideas like region, ethnicity, language, gender, nationality. For, in this increasingly interconnected world, students find themselves at the intersection of many ideas - evolving and fixed, dominant and marginalised. This rainbow of ideas provides an opportunity to appreciate the diversity in the constitution of an individual's identity. But what happens when one is given a chance to construct a digital identity for oneself? Digital platforms and social networking sites arguably provide an individual the choice to portray oneself the way one likes. Do we choose to present our authentic selves or do we prefer to present highly curated versions of ourselves? Do social media posts reflect self- respect and self-love?

Identity Formation and Validation in the Digital World

Through this session, students are expected to realise the ways in which they construct themselves digitally and how that construction is a manifestation of conformity, resistance and/or subversion, of the dominant ideologies. Students should be encouraged to reflect on what exactly they are seeking from engaging with social media. They need to think how the joy of sharing ideas may be different from the egoic need for compulsive validation.

Activities

Think of the digital filters that you use before sharing your photographs with others. Why do you think you need to do that?

We often feel happy about being validated in the form of 'likes' and positive comments on our social media posts. However, do you feel sad when that does not happen? What could be the possible reason for your mind to have this line of thought?

Digital Identities: Impact on the Self

The students will carry forward the learnings from the previous session and continue their inquiry in the realm of motivations for curating a digital self and its relation to self-esteem. They would be encouraged to engage in a non-judgemental conversation which would motivate them to inquire whether their digital activities are a result of anxiety which may be emanating from their self-image.

Activities

Do you think the use of digital filters is disrespectful to your self? Is not using them a source of anxiety for you? Can this have anything to do with your self-esteem?

Think of situations that make you feel sad on social media. Note them down. Do you think not exposing yourself to such a situation is a solution or do you think you also need to locate the issue within yourself?

Try spending a day without doing any activity on social media like posting anything or surfing other people's accounts for their activities. At the end of the day observe how you feel.

Unit IV

Lifestyle Choices

How we choose to live and behave influences our social and emotional wellbeing. In this module we analyse our lifestyle choices relating to material and cultural consumption, relationships and career. Students will be encouraged to inquire whether our everyday choices are based on a culture of passive consumption and conformism. We will seek to explore possibilities of alternative forms of living premised on ethical consumption, altruism, simple and sustainable living.

What Choices Does One Get to Make?

In this session, the attempt will be to explore the extent to which consumerism impacts our lifestyle choices and the repercussions of these on our natural and social environment. Today we live in an era of mass consumption and consumer culture fostered by advanced technologies and global production systems. Overt materialism, wasteful and conspicuous

consumption unmindful of the larger implications are key aspects of this phenomenon. In this lecture, we explore our lifestyle choices such as our physical image, attire, dietary choices, desire for dream homes and destination weddings. This would be the starting point for a re-imagination of a world based upon choices that would lead to simple and sustainable living.

Suggested Activities

Students may be asked to work through their consumption history right from their childhood. A discussion may then be initiated by asking the students to reflect on their consumption choices and their motives behind the same.

The teacher may identify a few products like tea, coffee, coca-cola, jeans etc and ask the students to trace product histories and geographies.

The students may be asked to discuss a strong desire to possess an object and then deconstruct that desire. Discussion may emphasise upon why they wanted it?

Is Choice Influenced? Relationships, Career Choices

In this lecture, we examine the extent to which lifestyle choices, regarding relationships and career, get influenced and by what factors. Do we really have a choice as regards the career that we intend to pursue? Often factors like family, gender, the need for security and stability influence our choices. Recognizing and mapping the space of freedom and unfreedom with respect to our choices is a necessary life skill that would enable a more self-aware and harmonious living.

Activities

Reflect on an instance where you may have inflicted pain on someone and also think of a moment when you felt someone was insensitive in their conduct of a relationship.

The teacher may divide the class into small groups and hold a discussion on what constitutes a successful career.

Reflect on the various career options available in your society and discuss what you would prefer to pursue and why?

Discrimination

The module is designed to help the learners understand the origin and nature of discrimination and the effects thereof. Discrimination can be on various grounds such as ethnicity, religion, caste, race, gender, disability, or place of birth. One's discriminatory actions can lead to social fragmentation. The module encourages the learners to introspect their actions and seeks to celebrate diversity.

Why and How? Forms of Discrimination

The objective of this lesson is to make learners aware of different forms of discrimination. On the one hand, an individual can be a victim of discrimination, and on the other, the same person

may harbour prejudice or discriminate against others. It is pertinent to understand our own biases and introspect our actions.

Activities

The teacher can ask students to count their friends who belong to different backgrounds. They can reflect on what they have learned by interacting with these friends.

Ask students to learn about their neighbourhood and document what groups live there, what has been the nature of their relationships.

An exercise on privilege using nothing but wadded up papers and a trash can. Students Learn A Powerful Lesson About Privilege. https://youtu.be/2KlmvmuxzYE

Stress and Its Management

This module is designed to give students an opportunity to articulate the pressures and challenges that one experiences in life. It gives students a chance to spell out how pressure to perform well can become a source of stress. The module is aimed to equip the learners with ways of dealing with disappointments with regard to the choice of career path and with performance related stress. It brings to fore skills of coping with stress and disappointments. It also highlights the role of physical well-being in keeping oneself mentally healthy.

Career Pressures, Examinations

This lesson is designed to help students have a relook at the challenges and pressures they have recently faced or are facing on account of career choices and examinations. It gives them a space to articulate what they might have faced while making these choices. This lesson also gives them an opportunity to highlight the uncertainties and challenges they foresee in their future lives.

Activities

The teacher may ask the students to organise themselves in groups of 4-6. Each of the groups have to do a role-play around the themes on career pressures.

Show images of different people and ask the students to quickly jot down impressions. The collective answers serve as a springboard for discussions. Students may learn about their own

biases through this activity.

The teacher may ask the students to identify movies where struggles related to career and performance pressure stand out.

The teacher may ask the students to share their experiences about the following:

- First few months into an academic programmes
- 2 months before examinations
- On the day of examination
- 15 days after examinations get over

Dealing with Disappointments, Coping Skills, Health and Fitness

This session aims to equip the learners with coping skills to manage stress and deal with disappointments. Furthermore, it makes them aware of the importance of health and fitness for maintaining mental health.

Activities

The teacher can ask the students to write how they come to know they are stressed and what they do when they are stressed? The teacher may engage them in a discussion on coping skills and channelize students' energies into positive ways of resolutions of conflict and stress.

The teacher may ask the students to discuss the lives of high achievers and low achievers and how performance pressures drive their lives. Can they draw similarities and differences in the sources of stresses and how they deal with these stresses?

Ask each of the students to share their daily regime to keep themselves physically fit. The students may also share how each one mentally 'feels/experiences' when one is engaged in physical exercises.

Connect with Nature

This module is designed to strengthen bonds with nature while understanding its intrinsic value as opposed to its instrumental value. Issues of global warming and environmental degradation are the consequences of a disconnect between humans and nature. The aim is to cultivate environmental awareness through virtues of altruistic responsibility, empathy, cohesiveness, and mutual sustainability between nature, flora-fauna, animals and humans. The students may be engaged in activities to build bridges between the inner environment (one's self) and external environment (nature). In this way, they can celebrate oneness with nature and perceive nature not as a means but an end in itself.

Sensitivity Towards Other Sentient Beings

The students, in this session, would participate in group based environmental activities as a way of building social responsibility towards all sentient beings. Any action against even a part of nature impacts the whole. Thus, it is the responsibility of all, to create a safe environment for all sentient beings to live in harmony.

Activities

Students can be encouraged for Nature walks, nature drives, treks and hikes, nature photography, adopting natural spaces in local areas, plantation drives, visiting biodiversity parks, adopting spaces for greening etc.

Visits to animal shelters can be organised to sensitise the students.

Films can be screened on environmental sustainability, environmental consciousness etc

- Any other Practical/Practice as decided from time to time

Suggested Readings

- Black,Donna Lord(2022). Essentials of Social and Emotional Learning (SEL). NJ : Wiley.
- Goleman,Damiel (2005). Emotional Intelligence.USA:Bantam.
- Swami Vivekanand. (2016).The complete works of Swami Vivekanand. Advaita Ashrama.(https://www.ramakrishnavivekanand.info/vivekanand/complete works.html)

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Course Title - Sports for Life

Course Objectives

- To imbibe the significance of sports to promote health, fitness and wellness in life.
- To understand the values of teamwork, tolerance, goal-setting and decision making.
- To learn the strategies and tactical moves while playing a sport.
- To understand the importance of physical activity in reference to 3S: strength, speed and suppleness.

Learning Outcomes

- Acquire values of cooperation, team spirit, determination, and endurance.
- Acquire good health and psychological well-being through sports participation.
- Apply the decision making-ability and goal-setting skills acquired through sports participation in everyday life.
- Acquire skills for engaging in moderate or vigorous physical activity and sports participation.
- Reduce exposure to screen time on electronic gadgets and channelising energy through sports participation.

Syllabus of *Sports for Life*

Unit I: Rules and Techniques
Concept • Rules of the Sport • Techniques / skills in the sport/ Aerobic Skills ***Practical*** • Marking of the court / field • Outdoor Adventure Activity • Skills learning in sports • Group Games / Relays • Participation in Intramural competitions

Unit II: Components of Fitness

Concepts

- Meaning and Development of Strength, Speed, Endurance, Flexibility and Coordinative Abilities.

Practical

- Skills learning and Participation in sports
- Group Games / Relays / Minor games
- Participation in Intramural competitions

Unit III: Benefits of sports and physical activity

Concepts

- Effect of exercise on the body
- Organizing of a sports competition
- Balanced Diet

Practical

- Skills learning and participation in sports
- Group Games, / Relays /Step Aerobics
- Participation in Intramural competitions

Unit IV: Sports in Contemporary Times

Concepts

- Honours and Awards associated with sports and sportspersons

Practical

- Skills learning and Participation in sports
- Participation in Intramural competitions

Note

- **The concepts are to be dealt with during the practical/practice classes.**

- The list of suggestive sports: Aerobics and Physical Activity, Athletics, Archery, Badminton, Basketball, Boxing, Chess, Carrom, Cricket, Football, Handball, Hockey, Kabaddi, Kho-Kho, Swimming, Shooting, Squash, Table-Tennis, Tennis, Taekwando, Volleyball, Wushu, Wrestling etc.

Suggested Readings

- James R Morrow Jr., Dale P. Mood, James G. Disch, Minsoo Kang - Measurement and Evaluation in Human Performance-Human Kinetics Publishers (2015)
- W.Larry Kenney, Jack H. Wilmore, Devid L.Costil.(2015). Physiology of Sports and Exercise, Second Edition. USA.Human Kinetics.
- Wener W.K. Hoeger, Sharon A. Hoeger - Fitness and Wellness-Cengage Learning (2014).
- Kansal DK (2012).A practical approach to Measurement Evaluation in Physical Education &Sports selection. Sports & Spiritual Science Publications, New Delhi.
- Websites of International Sports Federations, Ministry of Youth Affairs and Sports Govt. Of India.

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Coruse Title - Swachh Bharat

COURSE OBJECTIVES:

- To understand the developmental challenges with reference to sanitation infrastructure and practices.
- To build values of cleanliness, hygiene and waste management in diverse socio-economic contexts.
- To understand planning of social policy and programmes.
- To use waste management techniques at community level.
- To instill a sense of service towards society and the Nation. LEARNING OUTCOMES:
- Understanding the significance of the Swachh Bharat Abhiyan.
- Ability to analyse and predict the sanitation challenges of India
- Determine the link between sanitation and development.
- Contribute to the Swachh Bharat Abhiyan through real time projects/fieldwork

Syllabus of *Swachh Bharat*

Unit I: Introduction to Swachh Bharat Abhiyan
• Gandhian philosophy of Cleanliness • Swachh Bharat Abhiyan (SBA) • Hygiene, Sanitation & Sustainable Waste Management • Agencies and nodal Ministries for SBA • Different phases of the SBA and its evaluation • Citizens' Responsibilities: Role of *Swacchagrahi*
Unit II: Swachh Bharat: Rural and Urban Facets
• Indicators for Swachh Bharat • Rural ❖ Sanitation coverage across households (2014 vs. 2022) ❖ Open Defecation Free (ODF) Villages: Parameters ❖ ODF plus model: Key indicators • Urban ❖ Sustainable sanitation ❖ Waste/water and solid waste management ❖ Garbage Free Cities
Unit III: Prospects and Challenges
• Attitudes and Perceptions • Operational and Financial issues • Monitoring & Supervision • Community Mobilization

Practical/ Practice Component

Suggested Activities: List of activities to be undertaken:

- Identify plastic and e-waste in and around the institution and suggest innovative technologies to minimize wastage.
- Identify events/fests that generate maximum waste and ways to minimize it.
- Visit canteen/shops and track the lifecycle of wet/dry waste in and around the institution and document the findings in the form of a Project Report.
- Conduct interviews of stakeholders to understand the level of awareness.
- Conduct a Clean Audit of the Institution and identify areas for action.
- Conduct cleanliness drives.
- Organise Swachhata Pakhwada meetings, rallies, and mobilization camps within the identified
- communities.
- Students may participate in the Swachh Bharat Internship programme.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

Essential Readings

- "Swachh Bharat Mission - Gramin, Department of Drinking Water and Sanitation, Ministry of Jal Shakti"
- India 2021, Ministry of Information & Broadcasting
- http://swachhbharatmission.gov.in/SBMCMS/swachhta-pakhwada.htm
- https://swachhbharatmission.gov.in/SBMCMS/about-us.htm
- https://www.communityledtotalsanitation.org/sites/communityledtotalsanitation.org/files/ODF_verification_checklist.pdf
- https://sbm.gov.in/phase2dashboard/PhaseII/NationDashboard.aspx
- https://www.niti.gov.in/sites/default/files/2019-08/Report%20of%20Sub-Group%20of%20Chief%20Ministers%20on%20Swachh%20%20Bharat%20Anhiyaan.pdf

Suggested Readings

- **https://swachhbharatmission.gov.in/SBMCMS/writereaddata/Portal/Images/pdf/brochure/Greywatermanagement.pdf**
- **https://swachhbharatmission.gov.in/SBMCMS/writereaddata/Portal/Images/pdf/brochure/PWMB5_28th_June.pdf**
- GoI (2020). Swachh Bharat Mission (Grameen) Phase 2: Operational guidelines. Department of Drinking Water and Sanitation, Ministry of Jalshakti.
- MoHUA (2017). Guidelines for Swachh Bharat Mission - Urban (PDF). Ministry of Housing and Urban Affairs, Government of India.

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Course Title - Vedic Mathematics

Course Objectives:

- Foster love for maths and remove its fear through Vedic Mathematics
- Enhance computation skills in students through Vedic Mathematics
- Develop logical and analytical thinking
- Promote joyful learning of mathematics
- Discuss the rich heritage of mathematical temper of Ancient India

Learning Outcomes:

- Overcome the fear of maths
- Improved critical thinking
- Familiarity with the mathematical underpinnings and techniques
- Ability to do basic maths faster and with ease.
- Appreciate the Mathematical advancements of Ancient India.

Syllabus of *Vedic Mathematics*

Unit I: Vedic Maths- **High Speed Addition and Subtraction**
• Vedic Maths: History of Vedic Maths and its Features • Vedic Maths formulae: *Sutras* and *Upsutras* • Addition in Vedic Maths: Without carrying, Dot Method • Subtraction in Vedic Maths: *Nikhilam Navatashcaramam Dashatah* (All from 9 last from 10) • Fraction –Addition and Subtraction
Unit II: Vedic Math - **Miracle Multiplication and Excellent Division**
• Multiplication in Vedic Maths: Base Method (any two numbers upto three digits) • Multiplication by *Urdhva Tiryak Sutra* • Miracle multiplication: Any three-digit number by series of 1's and 9's • Division by *Urdhva Tiryak Sutra* (Vinculum method)
Unit III: Vedic Maths-**Lightening Squares and Rapid Cubes**
• Squares of any two-digit numbers: Base method • Square of numbers ending in 5: *Ekadhikena Purvena Sutra* • Easy square roots: *Dwandwa Yoga* (duplex) *Sutra* • Square root of 2: *Baudhayana Shulbasutra* • Cubing: *Yavadunam Sutra*
Unit IV. Vedic Maths-**Enlighten Algebra and Geometry**

- Factoring Quadratic equation: *Anurupyena, Adyamadyenantyamantya Sutra*
- Concept of *Baudhayana* (Pythagoras) Theorem
- Circling a square: *Baudhayana Shulbasutra*
- Concept of pi: *Baudhayana Shulbasutra*
- Concept angle (θ) $0^{\circ}, 30^{\circ}, 45^{\circ}, 60^{\circ}$ and 90°: *Baudhayana* number

Note: **Some of the theoretical concepts would be dealt with during practice hours.**

Practical/ Practice Component

he students are expected to demonstrate the application of Vedic Maths: *Sutra* and *Upsutra*

- Conduct workshops under the supervision of the course teacher to spread awareness on the utility of Vedic Mathematics.
- Students are required to visit nearby retail shops/local vendors to purchase stationery/vegetables/bread and butter and use tricks of Vedic maths of addition and subtraction to calculate the amount to pay and receive the difference.
- Students may share their experience with the class teacher in the form of audio-video presentations of 15 minutes.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

Essential Readings

- The Essential of Vedic Mathematics, Rajesh Kumar Thakur, *Rupa Publications*, New Delhi 2019.
- Vedic Mathematics Made Easy, Dahaval Bathia, *Jaico Publishing*, New Delhi 2011
- Vedic Mathematics: Sixteen Simple Mathematical formulae from the Vedas, Jagadguru Swami Sri Bharati Krishna Trithaji, *Motilal Banarasidas*, New Delhi 2015.
- Learn Vedic Speed Mathematics Systematically, Chaitnaya A. Patil 2018.

Suggested Readings

- A Modern Introduction to Ancient Indian Mathematics, T S Bhanumurthy, Wiley Eastern Limited, New Delhi
- Enjoy Vedic Mathematics, S M Chauthaiwale, R Kollaru, The Art of Living, Bangalore
- Magical World of Mathematics, VG Unkalkar, Vandana publishers, Bangalore

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Course Title - Yoga: Philosophy and Practice

Course Objectives

- To learn the fundamentals of Yoga for harmonising the body, mind and emotions.
- To demonstrate the value and the practice of holistic living.
- To value the heritage of Yoga for self and society.

Learning Outcomes

- Understanding ways to harmonise the body and mind through Yoga.
- Disciplining the mind through practicing Yoga.
- Understanding of consciousness through practical training.

Syllabus of *Yoga: Philosophy and Practice*

Unit I: Yoga: *Asana, Prāṇāyāma* and *Dhyana*
• History of Yoga • Significance of Asana • Effect of Praṇayama • Importance of *Dhyana*
Unit II: Patanjali's *Yogasūtra* and *Chakra*
• Patanjali's Yogasūtra: a summary • First sutra • Second sutra • *Chakras* (psychic centres)
Unit III: Understanding *Asana* and *Pranayama*
• Asana: the basics • *SuryaNamaskara* • *Nadishodhana Praṇayama*

Practical/ Practice Component

- Surya Namaskar
- Selected Asana
- *Praṇayama*
- Relaxation exercises for the eyes (7 steps) neck (4 steps)
- Concentration on *Bhrumadhya*

- Project Work (effect of everyday concentration on breath for 15 minutes: reflections to be compiled in the form of a Project report.
- Any other Practical/Practice as decided from time to time

Essential Readings

- Āsanas, Prāṇāyāmaand Mudra Bandh , Swami SatyanandaSaraswati, Yoga Publications Trust, Munger, Bihar, India, 2004.
- Patanjali Yogasutras, Commentary by Swami Vivekanand, Rajyoga

Suggested Readings

- PatanjalYog Pradeep- Swami OmanandSaraswati, Gita Press, Gorakhpur, 2013.
- Science of Pranayama-Swami Sivananda, Edition by David De Angellis, 2019, All Rights Reserved.
- Udayveer Shastri Granthavali,4, Patanjal- Yoga Darshanam, Udayavir Shastri, Govindram Hasanand, Delhi 6.

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Course Title - भारतीय भक्ति परंपरा और मानव मूल्य

COURSE OBJECTIVES

- भारतीय भक्ति की महान परंपरा, प्राचीनता और इसके अखिल भारतीय स्वरूप सेछात्रों का परिचय कराना
- भारतीय भक्ति परंपरा के माध्यम सेछात्रों मेंमानव मूल्यों और गुणों को जगाकर उनका चारित्रिक विकास करना और एक अच्छे मनुष्य का निर्माण करना ।
- छात्रों को भारतीय नैतिक, सांस्कृतिक और सामाजिक मल्ूयों के प्रति जागरूक करना ।
- भारतीय भक्ति परंपरा के माध्यम सेराष्ट्रीयता और अखिल भारतीयता की भावना जागतृ करना।

LEARNING OUTCOMES

- भारतीय भक्ति परंपरा के माध्यम सेछात्रों मेंमानव मल्ूयों और गुणों को विकास होगा और वे एक अच्छेऔर चरित्रवान मनष्ुय बन सकेंगे।
- भारतीय भक्ति परंपरा के सांस्कृतिक और सामाजिक पक्षों की जानकारी हो सकेगी।
- भक्ति की प्राचीनता और अखिल भारतीय स्वरूप की जानकारी सेराष्ट्रीयता और अखिल भारतीयता की भावना जागतृ और मजबतू होगी।
- प्रमखु भक्त कवियों का परिचय और उनके विचारों की जानकारी हो सकेगी।

Unit I: भारतीय भक्ति परंपरा

भक्ति: अर्थऔर अवधारणा भक्ति के विभिन्न संप्रदाय और सिद्धांत भारत की सांस्कृतिक एकता और भक्ति भक्ति का अखिल भारतीय स्वरूप
Unit II: भारत के कुछ प्रमखु भक्त और उनके विचार
संत तिरुवल्लवर ु , आण्डाल, अक्कमहादेवी, ललयद , मीराबाई, तलसीदास ु , कबीरदास, रैदास, गरु ु नानक, सरदास ू , जायसी, तकाराम ु , नामदेव, नरसिंह मेहता, वेमना, कं चन ु , नम्बियार, चैतन्य महाप्रभ, ुचंडीदास, सारला दास, शंकरदेव
Unit III: मानव मल्ू य और भक
मानव मल्ू य का अर्थ चयनित भक्त कवियों की जीवन मल्ू यपरक कविताएँ

Practical/ Practice Component

• पाठ्यक्रम मेंउल्लिखित कवियों मेंसेकिसी एक कवि की रचनाओंमेंविभिन्न मानव मल्ूयों केआधार पर प्रोजेक्ट

• वर्तमान समय मेंभक्ति की प्रासंगिकता को समझना; सर्वे और साक्षात्कार पद्धति केआधार पर.

• जीवन मेंमानव मल्ूयों के प्रतिपालन पर सर्वे और साक्षात्कार केआधार पर एक रिपोर्टबनाना.

• उल्लिखित कवियों मेंसेकिसी एक कवि सेसंबंधित किसी मठ, आश्रम या मंदिर आदि, अथवा कोई फिल्म/ डॉक्यमु ेंट्री केआधार पर रिपोर्टबनाना.

• आवश्यक हो, तो छात्र प्रोजेक्ट रिपोर्ट के रूप में अपने अनभव साझा कर ु ें

• Any other Practical/Practice as decided from time to time

Essential Readings

• 'भक्ति का उद्भव और विकास तथा वैष्णव भक्ति के विविध रूप', भारतीय साहित्य का समेकित इतिहास, संपादक- डॉ नगेंद्र, हिंदी माध्यम कार्यान्वयन निदेशालय, दिल्ली विश्वविद्यालय, दिल्ली, पष्ृठ संख्या 215-250

• कुछ प्रमखु कवियों के चयनित पद

• 'भक्ति आंदोलन और भक्ति काव्य', शिव कुमार मिश्र, अभिव्यक्ति प्रकाशन, इलाहाबाद, 1994

• 'मानव मल्ूय और साहित्य', डॉ धर्मवीर भारती, भारतीय ज्ञानपीठ, नई दिल्ली,1999 Suggested Readings:

• 'भक्ति केआयाम', डॉ. पी. जयरामन, वाणी प्रकाशन, नई दिल्ली

• 'हिंदी साहित्य का इतिहास', आचार्यरामचंद्र शक्ु ल, लोक भारती प्रकाशन, इलाहाबाद

- 'मध्यकालीन हिंदी काव्य का स्त्री पक्ष', डॉ. पनमू कुमारी, अनामिका पब्लिशर्सएंड डिस्ट्रीब्यटुर्स, नई दिल्ली

- 'मध्यकालीन हिंदी भक्ति काव्य: पनु मूल्मूयांकन केआयाम', डॉ. पनमू कुमारी, अनामिका पब्लिशर्सएंड डिस्ट्रीब्यटुर्स , नई दिल्ली

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Course Title - सृजनात्मक लेखन के आयाम

पाठ्यक्रम का उद्देश्य (Course Objectives):

1. सृजनात्मक और भाषायी कौशल का संक्षिप्त परिचय कराना
2. विचारों का प्रभावी प्रस्तुति करण करना
3. सृजनात्मक चिंतन और लेखन क्षमता को विकसित करना
4. मीडिया लेखन की समझ विकसित करना पाठ्यक्रम अध्ययन के परिणाम

(Learning Outcomes):

1. सृजनात्मक चिंतन और लेखन क्षमता का विकास हो सके गा
2. लेखन और मौखिक अभिव्यक्ति की प्रभावी क्षमता विकसित हो सके गी
3. मीडिया लेखन की समझ विकसित होगी
4. विद्यार्थी में अपने परिवेश, समाज तथा राष्ट्र के प्रति संवेदनशीलता का विकास होगा

Syllabus: सृजनात्मक लेखन के आयाम

इकाई – 1 (Unit I): सृजनात्मक लेखन • सृजनात्मक लेखन: अर्थ, स्वरूप और बोध • सृजनात्मक लेखन और परिवेश • सृजनात्मक लेखन और व्यक्तित्व निर्माण
इकाई – 2 (Unit II): सृजनात्मक लेखन : भाषिक संदर्भ
• भाव और विचार का भाषा में रूपान्तरण • साहित्यिक भाषा की विभिन्न छवियाँ • प्रिंट तथा इलेक्ट्रोनिक माध्यमों की भाषा का अंतर
इकाई 3 (Unit III): सृजनात्मक लेखन – विविध आयाम

- कविता, गीत, लघु कथा
- हास्य - व्यंग्य लेखन,
- पल्लवन, संक्षेपण, अनूच्छेद

Practical/ Practice Component

- कक्षा में प्रत्येक विद्यार्थी द्वारा 'मेरी पहली रचना' शीर्षक से किसी भी विधा में लेखन
- किसी भी साहित्यिक रचना का भाषा की दृष्टि से विश्लेषण
- इकाई- 3 में उल्लिखित विधाओं में विद्यार्थियों द्वारा लेखन एवं सामहू िक चर्चा
- प्रत्येक इकाई से संबन्धित परियोजना कार्य: o समसामयिक विषयों पर किसी भी विधा में लेखन – बदलते जीवन मल्ू य, महामारी, राष्ट्र निर्माण में छात्र की भमि ू का, यवाओं के क ु र्तव्य, पर्यावरण संरक्षण, लोकतन्त्र में मीडिया की भमि ू का, ऑनलाइन शॉपिंग अथवा अन्य समसामयिक विषय o किसी उत्सव, मेला, प्रदर्शनी, संग्रहालय और किसी दर्शनीय स्थल का भ्रमण तथा उस पर परियोजना कार्य
- प्रिंट माध्यम के खेल, राजनीति, आर्थिक और फिल्म जगत आदि से जड़ी साम ु ग्री का भाषा की दृष्टि से विवेचन
- इलेक्ट्रोनिक माध्यम के समाचार, धारावाहिक, विज्ञापन आदि का भाषा की दृष्टि से विवेचन
- आवश्यक हो, तो छात्र प्रोजेक्ट रिपोर्ट के रूप में अपने अनभव साझा कर ु ेंं
- Any other Practical/Practice as decided from time to time अनिवार्य पाठ

(ESSENTIAL READINGS)

- लेखन एक प्रयास, हरीश चन्द्र काण्डपाल

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Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System

Ability Enhancement Courses (AEC)

Semester – I (AEC- 1)

Science	Social Science/Arts	Commerce
• MIL	• MIL	• MIL

Semester – II (AEC- 2)

Science	Social	Commerce
• Environmental Science	• Environmental Science	• Environmental Science

Semester – III (AEC- 3)

Science	Social	Commerce
• Course on Disaster Risk Management	• Course on Disaster Risk Management	• Course on Disaster Risk Management

Semester – IV (AEC- 4)

Science	Social Science/Arts	Commerce
• Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports	• Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports	• Course on NCC/NSS/NGO's/ Social Service/Scout & Guide/Sports

List of Ability Enhancement Course (AEC)

SL. NO.	Course Title	LTP Distribution of the Course			Total Credits:	Total Marks = 100
		L	T	P		
1	MIL (Semester – I)	2	1	0	2	End -Term Appraisal : 70 Marks Internal Assessment: 30 Marks
2	Environmental Science (Semester – II)	2	1	0	2	
3	Course on Disaster Risk Management (Semester – III)	2	1	0	2	
4	Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports (Semester – IV)	2	1	0	2	

Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System

Ability Enhancement Course (AEC)

Semester – I (AEC- 1)

Science	Social Science/Arts	Commerce
• **MIL**	• **MIL**	• **MIL**

ENGLISH COMMUNICATION

Course Learning Objectives:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. The present course hopes to address some of the aspects of effective communication skills through an interactive mode of teaching-learning process. The various dimensions of communication skills that will be focused in the course include language of communication, speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc.

Syllabus:

1. Introduction:
   - Theory of Communication
   - Types and modes of Communication
   - Effective Communication/ Mis- Communication
   - Barriers and Strategies
2. Language of Communication:
   - Verbal and Non-verbal (Spoken and Written)
   - Personal, Social and Business
   - Intra-personal, Inter-personal and Group communication
3. Speaking Skills
   - Dialogue
   - Group Discussion
   - Interview
   - Public Speech
   - Role Play/Extempore Presentations

4. Reading and Understanding

- Close Reading
- Comprehension, Analysis and Interpretation

- Summary ParaphrasingTranslation (from Indian language to English and vice-versa)

Literary/Knowledge Texts

5. Writing Skills

- Making notes
- Documenting
- Report Writing
- Writing Letters - job applications, CV and Resume
- Academic Writing
- Writing a Proposal

Readings:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. 4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas

REMEDIAL ENGLISH

Learning Objectives:

English language skills – reading, writing, speaking and listening – are fundamental in constructing knowledge in all academic disciplines, succeeding in the world of work, and making sense of everyday life. The standards and benchmarks enlisted in this syllabus can help students adapt to the continually changing world of communication and develop a global outlook.

Through this course the students will be able to acquire the following set of literacy standards/ skills and implement them as working strategies: 1. Will engage in and gain basic proficiency in reading and comprehension 2. Will speak to a) inform b) describe c) explain d) persuade. The style and vocabulary will be at the beginners' level. 3. Make use of the grammar, syntax and tone of speech at the preliminary level. 4. Will read a variety of materials to facilitate comprehension. 5. Will understand the elements of grammar and its functions in a text. 6. Employ reading strategies such as scanning, selecting and summarising at the preliminary level. 7. Learn types of sentences – statement, question, exclamation, affirmative and negative. 8. Will gain and demonstrate basic competence in speaking, reading and writing.

Syllabus:

READING

1. Simple comprehension texts of description, narration, information, explanation and persuasion based on higher order thinking skills.
2. Contextualised grammar focus.
3. Vocabulary – basic synonyms and antonyms.

GRAMMAR

1. Parts of speech
2. Transformation of parts of speech
3. Nouns – gender and number; Countable and uncountable nouns
4. Verbs and tenses
5. Use of auxiliaries
6. Agreement of verb with subject
7. Use of articles
8. Use of adjectives and adverbs
9. Use of selected prepositions
10. Affirmative, negative and interrogative sentences
11. Question tags
12. Phrasal verbs
13. Direct and indirect narration

ENGLISH: ACADEMIC WRITING

Learning Objectives:

The syllabus aims to develop a critical and informed response to a range of texts/extracts, the skills of summarization and condensation, the skills of comprehension, the skills of analysis, synthesis and evaluation of content, correct usage and application of vocabulary.

Syllabus:

1. Features of Argumentative/Persuasive Writing

Reading and General Understanding

Writing practice: identifying arguments, counterarguments, non- arguments refuting arguments, style of persuasion, organizing an argumentative essay
Grammar Focus: Use of conjunctions as connectors, conditionals, noun clauses

2. Features of Comparison and Contrast Essay

Reading and General Understanding
Writing Practice: developing a comparison-contrast structure
Grammar Focus: Clauses for comparison, contrast, concession, transitions

3. Features of Literary Analysis

Reading and General Understanding

Writing Practice: plot devices, themes, symbols, figures of speech, tone, mood, style, organizing discourse structure

Grammar Focus: Conditional Sentences

4. Planning an Academic Essay

Writing Practice: discourse structure, essay-outline, paragraph-sequence, using citation.

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Semester – II (AEC- 2)

Science	Social Science/Arts	Commerce
• Environmental Science	• Environmental Science	• Environmental Science

Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems

- What is an ecosystem?
- Structure and function of ecosystem;
- Energy flow in an ecosystem: food chains, food webs and ecological succession.
- Case studies of the following ecosystems:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3: Natural Resources: Renewable and Non – renewable Resources

- Land resources and land-use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests,
- biodiversity and tribal populations.
- Water: Use and over – exploitation of surface and ground water, floods, droughts, confl - icts
- Over water (international & inter-state), Dams – benefits and problems.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects
- of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy
- sources, growing energy needs, case studies

Unit 4: Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Bio-geographic zones
- of India; Biodiversity patterns and global biodiversity hotspots.
- India as a mega-biodiversity nation; Endangered and endemic species of India, threats to
- biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Conservationof biodiversity: In – situandEx – situconservationofbiodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and
- Informational value.

Unit 5: Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise
- pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human
- communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution)
- Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest
- Conservation Act. International agreements: Montreal and Kyoto protocols and Convention
- on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian
- context.

Unit7: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
  - Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Water conservation, rain water harvesting, watershed management.
- Wasteland reclamation.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

1. Visit to local polluted site **(any one)**

   a) Urban: Identify the major sources of air pollution in a city or town of North Bengal region.
   b) Rural: Analyse the major sources of organic pollution in villages and adjoining agricultural fields.
   c) Industry: Prepare a list of the large and medium industries in and around your college are and the probable pollutants they may produce.

2. Study of flora and fauna **(any one)**

   a) Prepare a list of the economic plants available in the college block.
   b) List the birds sighted and found nesting at the college campus and its surroundings with the season of their occurrence.
   c) Record insects associated with any common crop/grassland/tree of the college area with an idea of their habitat.

3. Visit to local area to document environmental assets **(any one)**:

a) Trip to any riverine system of Terai or the dooars: comment on the direction, volume and quality of water, flowing as observed.
b) Record the nature of vegetation/forest type/land use pattern at the site of visit.
c) Analyse the cause of deforestation and landslide on hill slope, if sighted.

4. Study of ecosystems. **(any one)**

a) Pond: water parameters – turbidity, pH, producers (phyto and zooplanktons) and related consumers (fishes and birds).
b) Grassland on hill slope: producers (plants), insects, consumers (birds, mammals, reptiles etc.)
c) Forest: practical concept of forest type, stories, dominant trees and sub – dominant vegetation, observed and reported major herbivores and carnivores in a forest ecosystem.

5. Submission of a field work (covering the above practical works undertaken)

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Semester – III (AEC- 3)

Science	Social Science/Arts	Commerce
• Course on Disaster Risk Management	• Course on Disaster Risk Management	• Course on Disaster Risk Management

Learning Objectives:

The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

Introduction on Disaster Different Types of Disaster :

A) Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc.

B) Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.

Risk and Vulnerability Analysis :

1. Risk : Its concept and analysis
2. Risk Reduction
3. Vulnerability : Its concept and analysis
4. Strategic Development for Vulnerability Reduction

Disaster Preparedness and Response Preparedness:

1. Disaster Preparedness: Concept and Nature
2. Disaster Preparedness Plan
3. Prediction, Early Warnings and Safety Measures of Disaster.
4. Role of Information, Education, Communication, and Training,
5. Role of Government, International and NGO Bodies.
6. Role of IT in Disaster Preparedness
7. Role of Engineers on Disaster Management.

Response

1. Disaster Response: Introduction
2. Disaster Response Plan
3. Communication, Participation, and Activation of Emergency Preparedness Plan

4. Search, Rescue, Evacuation and Logistic Management

5. Role of Government, International and NGO Bodies

6. Psychological Response and Management (Trauma, Stress, Rumor and Panic)

7. Relief and Recovery

8. Medical Health Response to Different Disasters

10. Role of Educational Institute.

Rehabilitation, Reconstruction and Recovery

1. Reconstruction and Rehabilitation as a Means of Development.
2. Damage Assessment
3. Post Disaster effects and Remedial Measures.
4. Creation of Long-term Job Opportunities and Livelihood Options,
5. Disaster Resistant House Construction
6. Sanitation and Hygiene
7. Education and Awareness,
8. Dealing with Victims' Psychology,
9. Long-term Counter Disaster Planning

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4. Search, Rescue, Evacuation and Logistic Management

5. Role of Government, International and NGO Bodies

6. Psychological Response and Management (Trauma, Stress, Rumor and Panic)

7. Relief and Recovery

8. Medical Health Response to Different Disasters

10. Role of Educational Institute.

Rehabilitation, Reconstruction and Recovery

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7. Education and Awareness,
8. Dealing with Victims' Psychology,
9. Long-term Counter Disaster Planning

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Semester – IV (AEC- 4)

Science	Social Science/Arts	Commerce
• Course on NCC	• Course on NCC	• Course on NCC

Learning Objectives:

The course aims to :

(a) Provide knowledge about the history of NCC, its organization, and incentives of NCC for their career prospects.

(b) Inculcate spirit of duty and conduct in NCC cadets.

(c) Provide understanding about different NCC camps and their conducts.

(d) Provide understanding about the concept of national integration and its importance.

(e) Provide understanding about the concept of self-awareness and emotional intelligence.

(f) Provide understanding about the concept of critical & creative thinking.

(g) Provide understanding about the process of decision making & problem solving.

(h) Provide understanding about the concept of team and its functioning.

(i) Provide understanding about the concept and importance of Social service.

Learning Outcomes:

After completing this course, the cadets will be able to: -

(a) Understand the basic concept of NCC.

(b) Respect the diversity of different Indian culture.

(c) Practice togetherness, teamwork and empathy in all walks of their life.

(d) Do their own self-analysis and will work out to overcome their weakness for better performance in all aspects of life.

(e) Critically think and analyse.

Medium of Instruction: Hindi and English

Syllabus of NCC-I

Unit I: NCC General 4 Lectures
Subtopics: • Aims, Objectives and Organization of NCC • Incentives for NCC Cadets • Duties of NCC Cadets • NCC Camps: Types and Conduct
Unit II: National Integration
Subtopics: • National Integration: Importance and Necessity • Factors affecting National Integration • Unity in Diversity • Threats to National Security
Unit III: Personality Development
Subtopics: • Factors • Self-Awareness • Empathy • Critical and Creative Thinking • Decision Making and Problem Solving
Unit IV: Social Service and Community Development
Subtopics: • Basics of Social Service • Rural Development Programmes • NGO's • Contribution of Youth

Practical/Practice Component

- Drill
- Field Craft & Battle Craft
- Map Reading
- Weapon Training
- Social Service & Community Development
- Any other Practical/Practice as decided from time to time

Suggested Readings:

- DGNCC Cadet's Hand Book - Common Subjects -All Wings (in English)
- DGNCC Cadet's Hand Book - Common Subjects -All Wings (in Hindi)
- DGNCC Cadet's Hand Book – Specialised Subjects –Army, Navy and Air Wing

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To,

The Principal Secretary,
Raj Bhavan, Bihar,
Patna

Sub:-**Regarding submission of proposed course uniform syllabus of Mathematics for 3rd to 8th Semester of 4 - Year undergraduate Course under CBCS System as per UGC Regulations.**

Ref.:- Letter No.-BSU (UGC) -02/2023- 1457/ GS(I) dated 14.09.2023

Sir,

In compliance with your letter no. BSU(UGC)-02/2023-1457/GS(I), dated-14.09.2023, we are submitting the proposed course syllabus of **Mathematics** for 3rd to 8th semester of the 4 - year under graduate course (CBCS) as per UGC regulations.

Yours sincerely,

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Syllabus for Major Courses (Mathematics) Semester-III to VIII

SEMESTER- III

MJC-03: Real Analysis

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand many properties of the real line and learn to define sequence in terms of functions.
CO2: Recognize bounded, convergent, divergent, Cauchy and monotonic sequences.
CO3: Apply tests for convergence and absolute convergence of an infinite series of real numbers.

MJC-03: Real Analysis (5 credits) Full Marks- 100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Dedekind theory of real numbers, Algebraic and order properties of R, Archimedean Property, Density Theorem, Completeness property of R, Bounded sets, Theorems on Suprema and Infima.	10
2	Neighbourhood of a point in R, Open and closed sets, Limit points and isolated points of a set, Bolzano-Weierstrass theorem for a set, Derived set, Clouser and Interior of a set.	12
3	Sequence and its convergence, Bounded sequence, Monotone sequences, Subsequences, Limit of a sequence, Limit Theorem, Bolzano-Weierstrass theorem for sequences, Limit superior and limit inferior for bounded sequence, Cauchy sequence, Cauchy's general principle of convergence.	14
4	Infinite series and their convergence, Cauchy Criterion, Tests for convergence: Comparison test, D'Alembert Ratio Test, Cauchy's root test, Rabbe's test, Logarithmic test,D'Morgan and Bertrand's test, Cauchy integral test, Cauchy condensation test, Gauss's test, Alternating series, Leibnitz test, Absolute and Conditional convergence.	14
	TOTAL	50

Book References:

1. Bartle, Robert G., &Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). Wiley India Edition. New Delhi.
2. Ross, Kenneth A. (2013). Elementary Analysis: The theory of calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint.
3. Malik, S. C. & Arora, Savita. (2021). Mathematical Analysis (6th ed.). New Age International Publishers, New Delhi
4. Jha,K.K. Advanced Course in Real Analysis and Higher Analysis. New Bharat Publishing House.

HOD, Maths PPU (M.K. Upamanyu) (R.K. Singh) (Dr. Abdul Halim) (Dr. Vishal Kumar Baranwal) (S.B. Rai) (Dr. KUMAR VISHAL) (Dr. Anupam Kr. Singh) (B. Kumar)

SEMESTER- III
MJC-04: Ordinary Differential Equations

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the concept of ordinary differential equation.
CO2: Solve first order linear and non-linear differential equation and linear differential equations of higher order using various techniques.
CO3: Apply these techniques to solve and analyze various mathematical models.

MJC-04: Ordinary Differential Equations (4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Formulation of Differential equations and its order and degree, General, Particular and Singular solutions of differential equations, variables separable, Equations reducible to variables separable, Homogeneous differential equations, Equations reducible to homogeneous form, Exact differential equations and equations reducible to the exact form, Linear differential equations and equations reducible to linear form, Bernoulli equation.	10
2	Differential equations of first order but not of first degree, Singular solutions, Clairaut's form, Orthogonal Trajectories of family of curves,Wronskian and its properties, Linear differential equation of order greater than one with constant coefficients, Cauchy- Euler Equation, Legendre's Linear Equation.	10
3	Second order linear differential equations with variable coefficients: Use of a known solution to find another, normal form, method of undetermined coefficient, variation of parameters, Total differential equation in three variables, Simultaneous differential equations.	10
4	Definition of Laplace transform, Existence Theorem, Formulas and Properties of Laplace transform, Laplace transform of special functions viz: Dirac's delta, Unit step, Periodic, Bessel, Error functions, Inverse Laplace transform, Formulas and Properties of inverse Laplace transform, Convolution theorem, Solution of ordinary differential equation using Laplace transform.	10
	TOTAL	40

Book References:

1. Simmons, George F. (2016). Differential Equations with Applications and Historical Notes. Tata–McGraw Hill Publishing Company Limited, New Delhi.
2. Raisinghania, M.D. (2020). Ordinary and Partial Differential Equations (20th ed.). S. Chand Publication.
3. Bronson, R. &Coasta, Gabriel B. (2021). Schaum's Outline of Differential Equations (5th ed.). McGraw Hill.
4. Prasad, Lalji. (2019). Differential Equations. Paramount Publication.

SEMESTER – IV

MJC-05: Theory of Real Functions

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The concept of limit of a function.
CO2: The geometrical properties of continuous functions on closed intervals.
CO3: The applications of mean value theorem and Taylor's theorem.

MJC-05: Theory of Real Functions (Theory: 5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Limit of functions, Sequential criterion for limits, Divergence criteria, Limit theorems, One-sided limits, Infinite limits and limits at infinity.	10
2	Continuous functions, Sequential criterion for continuity and discontinuity, Algebra of continuous functions, Properties of continuous functions on closed intervals, Uniform continuity, Uniform continuity theorem.	14
3	Differentiability of a function, Algebra of differentiable functions, Increasing and Decreasing functions, Sign of derivatives, Chain rule, Darboux's theorem, Intermediate value theorem for derivatives, Rolle's theorem, Lagrange's and Cauchy's Mean value theorem and their applications.	14
4	Taylor's theorem with Lagrange's and Cauchy's remainder forms, Maclaurin's theorem, Application of Taylor's theorem in error estimation, Extreme values, Theorems related to extrema.	12
	TOTAL	50

Book References:

1. Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). Wiley India Edition. New Delhi.
2. Ross, Kenneth A. (2013). Elementary Analysis: The theory of calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint.
3. Malik, S. C. & Arora, S. (2021). Mathematical Analysis (6th ed.), New Age International Publishers, New Delhi
4. Jha,K.K. Advanced Course in Real Analysis and Higher Analysis. New Bharat Publishing House.

SEMESTER- IV

MJC-06: Group Theory

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.

CO2: Explain the significance of the notion of cosets, normal subgroups, and factor groups.

CO3: Understand Automorphism, Class Equation and Sylow's theorem.

MJC-06 : Group Theory (5 credits) Full Marks: 100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of groups, Elementary properties of groups, Subgroups and examples of subgroups, Generator of a group, Cyclic group, Properties of cyclic groups.	10
2	Permutations Group, Even and odd permutations, Alternating Group, Cosets and its properties, Lagrange's theorem, Fermat's Little theorem, Euler's theorem, Normal subgroups, Quotient groups, Center of a group, Normalizer of an element, Normalizer of a subgroup.	10
3	Group homomorphisms, Kernel of a group homomorphism, Fundamental theorem of group homomorphism, Isomorphisms, Properties of Isomorphisms, First, Second and Third isomorphism theorems for groups, Cayley's theorem.	10
4	Automorphism, Inner automorphism, Group of Automorphisms, Group Automorphisms of finite and infinite cyclic groups, Commutator subgroup.	08
5	Conjugacy classes, Class equation, p-groups, Cauchy's theorem for finite abelian groups, Sylow's theorems.	12
	TOTAL	50

Book References:

1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited, Delhi. Fourth impression, 2015.
2. Herstein I.N. (2003). Topics in Algebra (2nd ed.). John Wiley & Sons.
3. Khanna, Vijay K. & Bhambri, S. K. A Course in Abstract Algebra (5th ed.). Vikash Publishing House Private Limited, New Delhi.
4. Fraleigh, John B. (2002). A Course in Abstract Algebra (7th ed.). Pearson Education.

SEMESTER- IV

MJC-07: Partial Differential Equations

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Formulate, classify and transform partial differential equations into canonical form.
CO2: Solve linear and non-linear partial differential equations using various methods.
CO3: Solve some physical problems.

MJC-07: Partial Differential Equations (5 credits) Full Marks- 100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Partial differential equations – Basic concepts and definitions, Formation of PDEs, Classification of First order PDEs, Lagrange's and Charpit's method for solving PDEs.	14
2	Homogeneous and non-homogeneous Partial differential equation of second and higher order with constant coefficients, Partial differential equations reducible to equations with constant coefficients.	12
3	Partial differential equations of second order with variable coefficients, Monge's Methods, Classification of second order linear equations as hyperbolic, parabolic or elliptic, Reduction of second order linear equations to canonical forms.	10
4	Fourier series in (c, c + 2π), Dirichlet's condition (without proof), Euler's formulae, Fourier series for even and odd functions, Fourier series of arbitrary interval (0, 2L) and (-L, L), Fourier Half range sine and cosine series, Method of Separation of variables, Solution of the Wave, Heat and Laplace equations and their applications.	14
	TOTAL	50

Book References:

1. Sneddon, Ian N. (2006). Elements of Partial Differential Equations. Dover Publications. Indian Reprint.
2. Raisinghania, M. D. (2018).Advanced Differential Equations (19th ed.). S. Chand Publication.
3. Raisinghania, M.D. (2020). Ordinary and Partial Differential Equations (20th ed.). S. Chand Publication.
4. Amarnath T. An elementary course in Partial differential equations (2nd ed.). Narosa Publication.

SEMESTER -V

MJC-08: Ring Theory and Linear Algebra-I

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The fundamental concept of Rings, Fields, subrings, integral domains, ring homomorphisms and their properties.

CO2: The concept of linear independence of vectors over a field, the idea of a finite dimensional vector space, basis of a vector space and the dimension of a vector space.

CO3: Basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation, algebra of transformations and the change of basis.

MJC-08 : Ring Theory and Linear Algebra-I (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of rings, Properties of rings, Definition and examples of Subrings, Zero divisors, Integral domains and its examples, Properties of integral domains, Division rings, fields, Characteristic of a ring, Ideals and its properties, Quotient rings.	14
2	Ring homomorphisms, Kernel of Ring homomorphisms, Properties of ring homomorphisms, Isomorphism theorems for Rings.	10
3	Vector spaces, Subspaces, Algebra of subspaces, Linear combination of vectors, Linear span, Linear independence, Basis and dimension, Dimension of subspaces, Quotient spaces.	14
4	Linear transformations, Null Spaces and Ranges, Matrix representation of a linear transformation, Rank-Nullity theorem, Algebra of linear transformation, Eigenvalues and Eigenvectors, Characteristic equation of a matrix and Cayley-Hamilton theorem.	14
5	Isomorphisms for vector spaces, Isomorphism theorems for vector spaces, Invertibility and Isomorphisms.	8
	TOTAL	60

Book References:

1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited. Delhi. Fourth impression, 2015.
2. Herstein, I. N. (2006). Topics in Algebra (2nd ed.). Wiley Student Edition. India.
3. Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2003). Linear Algebra (4th ed.). Prentice-Hall of India Pvt. Ltd. New Delhi.
4. Kumaresan, S. (2000). Linear Algebra: A Geometric Approach, Prentice Hall India Learning Private Limited, New title Edition.
5. Hoffman, Kenneth & Kunze, Ray Alden (1978). Linear Algebra (2nd ed.). Prentice-Hall of India Pvt. Limited. Delhi. Pearson Education India Reprint, 2015.

SEMESTER – V

MJC-09: Multivariate Calculus

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The conceptual variations when advancing in calculus from one variable to multivariable discussions.

CO2: Inter-relationship amongst the line integral, double and triple integral formulations.

CO3: Applications of multi variable calculus tools in physics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

MJC-09 : Multivariate Calculus (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Functions of several variables, Limits and continuity, Partial derivatives, Euler's theorem, Higher order partial derivatives, Total differential and differentiability, Schwarz and Young's theorem, Chain rule.	12
2	Directional derivatives, Gradient, Maximal and normal property of the gradient, Tangent planes and normal lines, Level curves and surfaces, Gradient and Tangents to Level curves, Extrema of functions of two variables, Critical points, Saddle points, Method of Lagrange multipliers.	12
3	Double integrals in Cartesian and polar co-ordinates, area and surface area, Triple integrals, Volume by triple integrals, triple integrals in cylindrical and spherical coordinates, Change of variables in double and triple integrals.	14
4	Line integrals, Applications of line integrals: Mass and Work, Fundamental theorem for line integrals, Definition of vector field, Conservative vector fields, Divergence and curl.	12
5	Green's theorem- Tangential and Normal form, Evaluation of line integrals using Green's theorem, Surface integrals, Stokes' theorem, The Gauss divergence theorem.	10
	TOTAL	60

Book References:

1. Malik, S.C. & Arora, Savita (2017). Mathematical Analysis, New Age International Private Limited.
2. Strauss, Monty J., Bradley, Gerald L., & Smith, Karl J. (2007). Calculus (3rd ed.). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Delhi. Indian Reprint 2011.
3. Marsden, J. E., Tromba, A., & Weinstein, A. (2004). Basic Multivariable Calculus. Springer (SIE). First Indian Reprint.
4. George B. Thomas, Joel Hass, Christopher Heil, Maurice D. Weir, Thomas' Calculus, 14e Paperback, Pearson Education.
5. Prasad Lalji, Advanced Calculus, Paramount Publications, Revised Edition (2015).

SEMESTER – VI
MJC-10: Complex Analysis

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.

CO2: Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.

CO3: Expand some simple functions as their Taylor and Laurent series, get familiar with the linear transformation and Mobius transformation.

MJC-10: Complex Analysis (4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Introduction to complex number and its geometrical interpretation, algebra of complex numbers, functions of complex variables, limit of a complex function, continuity and uniform continuity, differentiability, Analytic and regular functions, Cauchy-Riemann equation and it's applications.	08
2	Exponential function, logarithmic function, Branches and derivatives of logarithms, trigonometric and hyperbolic functions, derivatives of functions, Definite integrals of functions, Contours, Contour integrals with examples, Upper bounds for moduli of contour integrals.	08
3	Complex integration, Cauchy's theorem, Cauchy's Goursat theorem, primitives, Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Morera's theorem, Poisson's integral formula for a circle, Cauchy's inequality, Liouville's Theorem and Fundamental theorem of Algebra.	08
4	Convergence of sequences and series, Taylor series with examples; Laurent series and its examples, Absolute and uniform convergence of power series, Uniqueness of series representations of power series.	08
5	Linear Transformation, Jacobian of a transformation, Elementary transformations: translation, rotation, magnification, inversion, Mobius transformation (bilinear transformation), Cross ratio, preservation of cross ratio under bilinear transformation, fixed point of a bilinear transformation.	08
	TOTAL	40

Book References:

1. Brown, James Ward, & Churchill, R. V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. New York.
2. S. Ponnusamy, (2011) Foundation of complex Analysis, Alpha Science International Ltd. UK.
3. Bak, Joseph & Newman, Donald J. (2010). Complex analysis (3rd ed.). Undergraduate Texts in Mathematics, Springer. New York.
4. Zills, Dennis G., & Shanahan, Patrick D. (2003). A First Course in Complex Analysis with Applications. Jones & Bartlett Publishers, Inc.
5. Mathews, John H., & Howell, Rusell W. (2012). Complex Analysis for Mathematics and Engineering (6th ed.). Jones & Bartlett Learning. Narosa, Delhi. Indian Edition.

SEMESTER – VI

MJC-11: Metric Space

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the basic concepts of metric spaces;

CO2: Correlate these concepts to their counter parts in real analysis;

CO3: Understand the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imaginations.

MJC-11: Metric Space (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of metric spaces, notion of Open and closed ball, Neighborhood of a point, Open set, Interior point, Interior of a set, Limit point of a set, Derived set, Closed set, Closure of a set, Diameter of a set, Dense set, Subspaces.	12
2	Sequences in metric spaces, Cauchy sequences, Complete metric space, Cantor's intersection theorem, Baire's category theorem, Contraction mapping, Banach fixed point theorem.	12
3	Continuous mappings, Sequential criterion and other characterizations of continuity, Uniform continuity, Homeomorphism.	10
4	Connectedness, Connected subsets of R, Connectedness and continuous mappings.	08
5	Compactness, boundedness, Continuous functions on compact spaces.	08
	TOTAL	50

Book References:

1. Kumaresan, S. (2014). Topology of Metric Spaces (2nd ed.). Narosa Publishing House. New Delhi.
2. Simmons, G. F. (2004). Introduction to Topology and Modern Analysis. Tata McGraw Hill. New Delhi.
3. E.T. Copson, (1968) Metric Spaces, Cambridge University Press
4. S. Shirali and H.L. Vasudeva, Metric Spaces, Springer.
5. P. K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House.

SEMESTER – VI
MJC-12: Riemann Integration and Series of Functions

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

CO2: Apply Beta and Gamma functions and their properties in finding improper integrals, area under a curve and surface of revolution.

CO3: The valid situations for the inter-changeability of differentiability and integrability with infinite sum, and approximation of transcendental functions in terms of power series.

MJC-12: Riemann Integration and Series of Functions (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and existence of Riemann Integral of bounded functions,Darboux theorem,necessary and sufficient condition for R-Integrability, Riemann integrability of continuous functions, monotonic function and function having finite number of discontinuities, Riemann integral as the limit of a sum, fundamental theorem of integral calculus, Mean value theorems.	14
2	Improper integrals of Type-I, Type-II and mixed type, test for convergence of improper integral such as comparison test and μ-test, Convergence of Beta and Gamma functions and their properties.	12
3	Pointwise and uniform convergence of sequence of functions, Cauchy criterion for uniform convergence, theorems on boundedness, continuity, derivability and integrability of the limit function of a sequence of functions with uniform convergence.	08
4	Series of functions, Theorems on the continuity, integrability and derivability of the sum function of a uniformly convergence series of functions, Cauchy criterion for uniform convergence and Weierstrass M-Test.	08
5	Power series, radius of convergence, Cauchy Hadamard Theorem, Differentiation and integration of power series, Abel's Theorem, Weierstrass Approximation Theorem.	08
	TOTAL	50

Book References:

1. Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). Wiley India Edition. Delhi.
2. Ghorpade, Sudhir R. & Limaye, B. V. (2006). A Course in Calculus and Real Analysis. Undergraduate Texts in Mathematics, Springer (SIE). First Indian reprint.
3. Ross, Kenneth A. (2013). Elementary Analysis: The Theory of Calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer.
4. Shanti Narayan, Elements of Real Analysis, S. Chand Publication.
5. S. Ponnusamy, Foundations of Mathematical Analysis, Birkhasuer.
6. K K Jha, Advanced Real Analysis.
7. S.K. Mapa, Introduction to Real Analysis, Sarat Book Distributor, Kolkata.

SEMESTER – VII

MJC-13: Ring Theory and Linear Algebra-II

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Appreciate the significance of factorization in rings and integral domains.
CO2: Compute the characteristic polynomial, eigenvalues, eigenvectors, and eigenspaces, as well as the geometric and the algebraic multiplicities of eigenvalues.
CO3: Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization to obtain orthonormal basis.

MJC-13: Ring Theory and Linear Algebra-II (5 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Field of quotients of an integral domain, Embedding of rings, Polynomial rings, The Division algorithm and consequences, The Remainder Theorem, The Factor Theorem, Irreducible Polynomials, Reducible polynomials, Primitive Polynomial, Gauss's Lemma, Irreducibility tests, Unique factorization domains.	14
2	Linear Functionals, Dual spaces, dual basis, Double dual, Annihilators, Transpose of a linear transformation and its matrix in the dual basis.	12
3	Eigenspaces of a linear operator, Diagonalization of Linear Operators, Invariant subspaces, The minimal polynomial for a linear operator.	10
4	Inner products and Norms, Orthonormal basis, Gram-Schmidt orthogonalization process, Orthogonal complements, Bessel's inequality.	10
5	The adjoint of a linear operator, Least squares approximation, Minimal solutions to systems of linear equations, Normal and Self-Adjoint Operators, Unitary and orthogonal operators	14
	TOTAL	60

Book References:

1. Gallian, Joseph. A. (2019). Contemporary Abstract Algebra (9th ed.), Cengage Learning India Private Limited.
2. Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2022). Linear Algebra (5th ed.), Pearson Education.
3. Herstein, I. N. (2006). Topics in Algebra (2nd ed.). Wiley Student Edition. India.
4. Hoffman, Kenneth M., & Kunze, Ray Alden (1978). Linear Algebra (2nd ed.). Prentice-Hall of India Pvt. Limited. Delhi. Pearson Education India Reprint, 2015.
5. Kumaresan, S. (2000). Linear Algebra: A Geometric Approach, Prentice Hall India Learning Private Limited, New title Edition

SEMESTER – VII
MJC-15: Numerical Methods

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: Various numerical techniques to find the zeroes of nonlinear functions of single variable and solution of a system of linear equations up to a certain given level of precision.

CO2: Interpolation techniques to compute the values of functions for equal and unequal intervals.

CO3: Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.

MJC-15: Numerical Methods (6 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Errors: Relative, Absolute, Round off, Truncation, Finding roots of Transcendental and Polynomial equations: Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method, Fixed point iteration method, Rate of convergence.	12
2	Solution of system of linear algebraic equations: Partial pivoting, LU decomposition and its applications, Gaussian Elimination and Gauss Jordan methods, Gauss Jacobi method, Gauss Seidel method, SOR methods and their convergence analysis.	12
3	Finite differences, Interpolation, Newton's Forward and Backward interpolation, Stirling's Formula, Bessel formula, Newton's divided difference, Lagrange's Interpolation, Inverse Interpolation.	12
4	Numerical differentiation, Numerical Integration: Newton Cotes formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpsons $3/8^{th}$ rule, Gauss quadrature formula.	12
5	Solution of difference equation of the first order, General solution, Linear difference equation with constant co-efficient, Solution of ordinary differential equations one step method: Euler's and modified Euler's method, Picard's method, Runge-Kutta methods.	12
	TOTAL	60

Book References:

1. S. S. Sastry, Introductory Methods of Numerical Analysis: Prentice-Hall of India, 5th edition, 2012.
2. S. R. K. Iyengar, R. K. Jain and M. K. Jain, Numerical Methods for Scientific and Engineering Computation: New Age International, 6th edition, 2012.
3. V. Rajaraman, Computer oriented Numerical Methods: Prentice-Hall of India, 3rd edition, 2004.
4. E. Balaguruswamy, Numerical Methods: Mcgraw Hill Education, 1st edition, 1999.
5. Bradie, Brian. (2006). A Friendly Introduction to Numerical Analysis. Pearson Education, India. Dorling Kindersley (India) Pvt. Ltd. Third impression 2011.

SEMESTER – VIII

MJC-16: Mathematical Finance

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Interest rates and its types.

CO2: Financial markets and derivatives including options and futures.

CO3: Pricing and hedging of options, interest rate swaps and no-Arbitrage pricing concept.

MJC-16 : Mathematical Finance (Theory: 4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Interest rates, Types of rates, Measuring interest rates, Zero rates, Bond pricing, Forward rate, Duration, Convexity, Exchange traded markets and OTC markets.	10
2	Derivatives--Forward contracts, Futures contract, Options, Types of traders, Hedging, Speculation, Arbitrage, No Arbitrage principle, Short selling, Forward price for an investment asset.	10
3	Types of Options, Option positions, Underlying assets, Factors affecting option prices, Bounds on option prices, Put-call parity, Early exercise, Effect of dividends.	10
4	Binomial option pricing model, Risk neutral valuation (for European and American options on assets following binomial tree model), Lognormal property of stock prices, Distribution of rate of return, expected return.	10
	TOTAL	40

Book References:

1. Hull, J. C., &Basu, S. (2010). Options, Futures and Other Derivatives (7th ed.). Pearson Education. New Delhi.
2. Luenberger, David G. (1998). Investment Science, Oxford University Press. Delhi.
3. Ross, Sheldon M. (2011). An elementary Introduction to Mathematical Finance (3rd ed.). Cambridge University Press. USA.

Syllabus for Minor Courses (Mathematics) Semester-III to VIII

SEMESTER- III

MIC-03: Real Analysis

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand many properties of the real line and learn to define sequence in terms of functions.
CO2: Recognize bounded, convergent, divergent, Cauchy and monotonic sequences.
CO3: Apply tests for convergence and absolute convergence of an infinite series of real numbers.

MIC-03: Real Analysis (3 credits) Full Marks- 100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Dedekind theory of real numbers, Algebraic and order properties of R, Archimedean Property, Density Theorem, Completeness property of R, Bounded sets, Theorems on Suprema and Infima.	10
2	Sequence and its convergence, Bounded sequence, Monotone sequences, Subsequences, Limit of a sequence, Limit Theorem, Bolzano-Weierstrass theorem for sequences, Cauchy sequence, Cauchy's general principle of convergence.	10
3	Infinite series and their convergence, Cauchy Criterion, Tests for convergence: Comparison test, D'Alembert Ratio Test, Cauchy's root test, Rabbe's test, Logarithmic test, Cauchy integral test, Gauss's test, Alternating series, Leibnitz test, Absolute and Conditional convergence.	10
	TOTAL	30

Book References:

1. Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). Wiley India Edition. New Delhi.
2. Ross, Kenneth A. (2013). Elementary Analysis: The theory of calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint.
3. Malik, S. C. & Arora, Savita. (2021). Mathematical Analysis (6th ed.). New Age International Publishers, New Delhi.
4. Jha,K.K. Advanced Course in Real Analysis and Higher Analysis. New Bharat Publishing House.

SEMESTER-IV

MIC-04: Ordinary Differential Equations

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the concept of ordinary differential equation.
CO2: Solve first order linear and non-linear differential equation and linear differential equations of higher order using various techniques.
CO3: Apply these techniques to solve and analyze various mathematical models.

MIC-04: Ordinary Differential Equations (3 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Formulation of Differential equations and its order and degree, General, Particular and Singular solutions of differential equations, variables separable, Equations reducible to variables separable, Homogeneous differential equations, Equations reducible to homogeneous form, Exact differential equations and equations reducible to the exact form, Linear differential equations and equations reducible to linear form, Bernoulli equation.	10
2	Differential equations of first order but not of first degree, Singular solutions, Clairaut's form, Linear differential equation of order greater than one with constant coefficients, Cauchy- Euler Equation, Legendre's Linear Equation.	10
3	Second order linear differential equations with variable coefficients: Use of a known solution to find another, normal form, method of undetermined coefficient, variation of parameters, Total differential equation in three variables, Simultaneous differential equations.	10
	TOTAL	30

Book References:

1. Simmons, George F. (2016). Differential Equations with Applications and Historical Notes. Tata–McGraw Hill Publishing Company Limited, New Delhi.
2. Raisinghania, M.D. (2020). Ordinary and Partial Differential Equations (20th ed.). S. Chand Publication.
3. Bronson, R. &Coasta, Gabriel B. (2021). Schaum's Outline of Differential Equations (5th ed.). McGraw Hill.
4. Prasad, Lalji. (2019). Differential Equations. Paramount Publication.

SEMESTER – V

MIC-05: Theory of Real Functions

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The concept of limit of a function.
CO2: The geometrical properties of continuous functions on closed intervals.
CO3: The applications of mean value theorem.

MIC-05: Theory of Real Functions (3 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Limit of functions, Sequential criterion for limits, Divergence criteria, Limit theorems, One-sided limits, Infinite limits and limits at infinity.	08
2	Continuous functions, Sequential criterion for continuity and discontinuity, Algebra of continuous functions, Properties of continuous functions on closed intervals.	10
3	Differentiability of a function, Algebra of differentiable functions, Increasing and Decreasing functions, Sign of derivatives,Darboux's theorem, Intermediate value theorem for derivatives, Rolle's theorem, Lagrange's and Cauchy's Mean value theorem and their applications.	12
	TOTAL	30

Book References:

1. Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). Wiley India Edition. New Delhi.
2. Ross, Kenneth A. (2013). Elementary Analysis: The theory of calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint.
3. Malik, S. C. & Arora, S. (2021). Mathematical Analysis (6th ed.), New Age International Publishers, New Delhi.
4. Jha,K.K. Advanced Course in Real Analysis and Higher Analysis. New Bharat Publishing House.

SEMESTER- V

MIC-06: Group Theory

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.

CO2: Explain the significance of the notion of cosets, normal subgroups, and factor groups.

CO3: Understand the concept of group homomorphism and isomorphism.

MIC-06: Group Theory (3 credits) Full Marks: 100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of groups, Elementary properties of groups, Subgroups and examples of subgroups, Generator of a group, Cyclic group, Properties of cyclic groups.	10
2	Permutations Group, Even and odd permutations, Alternating Group, Cosets and its properties, Lagrange's theorem, Fermat's Little theorem, Normal subgroups, Quotient groups, Center of a group, Normalizer of an element, Normalizer of a subgroup.	10
3	Group homomorphisms, Kernel of a group homomorphism, Fundamental theorem of group homomorphism, Isomorphisms, Properties of Isomorphisms, First, Second and Third isomorphism theorems for groups, Cayley's theorem.	10
	TOTAL	30

Book References:

1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited, Delhi. Fourth impression, 2015.
2. Herstein I. N. (2003). Topics in Algebra (2nd ed.). John Wiley & Sons.
3. Khanna, Vijay K. & Bhambri, S. K. A Course in Abstract Algebra (5th ed.). Vikash Publishing House Private Limited, New Delhi.
4. Fraleigh, John B. (2002). A Course in Abstract Algebra (7th ed.). Pearson Education.

SEMESTER- VI

MIC-07: Partial Differential equation

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Formulate, classify and transform partial differential equations into canonical form.

CO2: Solve linear and non-linear partial differential equations using various methods; and apply these methods in solving some physical problems.

CO3: Apply Laplace transformation for solving PDEs.

MIC-07: Partial Differential Equation (3 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Introduction to PDEs, Order and Degree of a PDE, Classification of partial differential equations (PDEs), formation and solution of PDEs, derivation of PDEs by elimination of arbitrary functions.	10
2	Linear partial differential equation of first order, Lagrange's solution of linear equation, Solution of partial differential equations using Charpit's method, solution of equations of the form f(p,q)=0, f(z,p,q)=0, f(x,p)=f(y,q) and z=px+qy+f(p,q) using Charpit's method.	10
3	Laplace transforms and its application to partial differential equations. Inverse Laplace transformations and its properties, convolutions.	10
	TOTAL	30

Book References:

1. Myint-U, Tyn& Debnath, Lokenath. (2007). Linear Partial Differential Equation for Scientists and Engineers (4th ed.). Springer, Third Indian Reprint, 2013.
2. Sneddon, I. N. (2006). Elements of Partial Differential Equations, Dover Publications. Indian Reprint.
3. M. D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand Publication.
4. Peter J. Olver, Introduction to partial differential equations, Speringer
5. S.K. Pundir and R. Pundir, Advanced Partial Differential Equations (with boundary value problems), Pragati Prakashan.

SEMESTER- VI

MIC-08: Ring Theory and Linear Algebra

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The fundamental concept of Rings, subrings, ideals and the corresponding homomorphisms.

CO2: The concept of linear independence of vectors over a field, the idea of a finite dimensional vector space, basis of a vector space and the dimension of a vector space.

MIC-08: Ring Theory and Linear Algebra (3 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Definition and examples of rings, properties of rings, subrings, characteristics of a subring, Ideal, Ideal generated by a subset of a ring, quotient ring, operation on ideals, prime and maximal ideals.	10
2	Ring homomorphisms, properties of ring homomorphism, isomorphism theorems.	10
3	Definition of linear space, general properties of linear space, vector subspaces, linear combination of vectors, linear span. Linear dependence and independence of vectors, basis of a vector space, finite dimensional vector spaces.	10
	TOTAL	30

Book References:

1. Gallian, Joseph. A. (2013). Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited. Delhi. Fourth impression, 2015.
2. Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2003). Linear Algebra (4th ed.). Prentice-Hall of India Pvt. Ltd. New Delhi.
3. I.N. Herstein, Abstract Algebra, Prentice Hall, New Jersey.
4. Hoffman and Kunze, Linear Algebra.
5. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
6. Lalji Prasad, Linear Algebra, Paramount Publications.
7. S.K. Mapa, Higher Algebra (Abstract and Linear), Levant Books, Kolkata.

SEMESTER- VII

MIC-09: Multivariate Calculus

Course Outcomes

After the completion of the course, the student will be able to understand:

CO1: The conceptual variations when advancing in calculus from one variable to multivariable discussions.
CO2: Inter-relationship amongst the line integral, double and triple integral formulations.
CO3: Applications of multi variable calculus tools in different disciplines.

MIC-09 : Multivariate Calculus (4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Functions of several variables, Limits and continuity, Partial derivatives, Higher order partial derivatives, Euler's theorem on Homogeneous function	10
2	Double integrals in Cartesian and polar co-ordinates, Triple integrals, Change of variables in double and triple integrals.	10
3	Line integrals, Applications of line integrals: Mass and Work, Fundamental theorem for line integrals, Definition of vector field, Conservative vector fields, Divergence and curl.	10
4	Green's theorem- Tangential and Normal form, Evaluate line integrals using Green's theorem, Surface integrals, Stokes' theorem.	10
	TOTAL	40

Book References:

1. Malik, S.C. & Arora, Savita (2017). Mathematical Analysis, New Age International Private Limited.
2. Marsden, J. E., Tromba, A., & Weinstein, A. (2004). Basic Multivariable Calculus. Springer (SIE). First Indian Reprint.
3. Thomas' Calculus, 14e Paperback, George B. Thomas, Joel Hass, Christopher Heil, Maurice D. Weir, Pearson Education.
4. Prasad Lalji, Advanced Calculus, Paramount Publications, Revised Edition (2015).

SEMESTER- VIII

MIC-10: Complex Analysis

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.

CO2: Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.Expand some simple functions as their Taylor and Laurent series.

MIC-10: Complex Analysis (4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Introduction to complex number and geometrical interpretation, algebra of complex numbers, functions of complex variables, limit of a complex function, continuity and uniform continuity, differentiability, Analytic and regular function, Cauchy-Riemann equation and it's applications.	10
2	Exponential function, logarithmic function, Branches, trigonometric and hyperbolic functions, derivatives of functions, Definite integrals of functions, Contours, Contour integrals and its examples.	10
3	Complex integration, Cauchy's theorem, Cauchy's Goursat theorem (Statement only), primitives, Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Morera's theorem.	10
4	Convergence of sequences and series, Taylor series and its examples; Laurent series and its examples, Absolute and uniform convergence of power series.	10
	TOTAL	40

Book References:

1. Brown, James Ward, & Churchill, Ruel V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. New York.
2. S. Ponnusamy, (2011) Foundation of complex Analysis, Alpha Science International Ltd. UK.
3. Bak, Joseph & Newman, Donald J. (2010). Complex analysis (3rd ed.). Undergraduate Texts in Mathematics, Springer. New York.
4. Zills, Dennis G., & Shanahan, Patrick D. (2003). A First Course in Complex Analysis with Applications. Jones & Bartlett Publishers, Inc.
5. Mathews, John H., & Howell, Rusell W. (2012). Complex Analysis for Mathematics and Engineering (6th ed.). Jones & Bartlett Learning. Narosa Delhi. Indian Edition.