MOOLJI JAITHA COLLEGE, JALGAON

□NAAC Reaccredited "A" Grade (CGPA 3.15) □ISO 9001:2008 Certified
□UGC honored "College of Excellence"

ESTD. 1945

TEACHING PLAN

Name of Teacher: Dr. J. N. Chaudhari   Faculty: Science

Department: Mathematics   Academic Year: 2020-21

Class: T. Y. B. Sc.   Subject: Mathematics

Title of Paper: MTH-506(B): Number Theory

MTH-603 Linear Algebra

Month	Topic/s to be Covered	No. of Hours required
August	**Prime numbers and Diophantine Equations:** The Fundamental Theorem of Arithmetic, The Sieve of Eratosthenes, The Goldbach Conjecture, The Diophantine Equation $ax + by = c$.	12
September	**The theory of congruences:** Basic Properties of Congruence, Binary and decimal representations of integers, Linear Congruences and the Chinese Remainder Theorem, Fermat's Factorization Method.	12
October	**Fermats Theorem and Perfect numbers:** The Little Theorem and pseudoprimes, Wilson's Theorem, Perfect Numbers, Mersenne Numbers, Fermat's Numbers.	12
November	**Fibonacci numbers and Finite continued fractions:** The Fibonacci Sequence, Certain Identities Involving Fibonacci Numbers, Finite continued fractions.	9
February	**Vector Spaces :** Vector spaces, Subspaces, Examples, Necessary and sufficient conditions for a subspace, Addition, Intersection and union of subspaces, Quotient space, Linear span and properties, **Basis and Dimensions:** Linear dependence and independence, Basis and dimension of finite dimensional vector spaces,	13
March	Co-ordinates of a vector, Existence theorem and its applications. Theorems on basis and dimensions. **Linear Transformations: Introduction, Linear transformations, Kernel and image of linear transformations,** Range space and null space of linear transformations, Rank and nullity theorem.	13
April	Algebra of linear transformations, Invertible linear transformations, Singular and non-singular linear transformations. **Eigen values and Eigen vectors :** Matrix polynomial, Eigen values and Eigen vectors of linear Transformation, Diagonalization and Eigen vectors, Cayley Hamilton Theorem, Characteristics polynomial and minimum polynomial,	12
May	**Matrices and Linear Transformation:** Matrix representation of linear operator, Change of basis, Similarity, Diagonalization of matrix.	7

Head,
Department of Mathematics
M.J.College,Jalgaon

ESTD. 1945

TEACHING PLAN

Name of Teacher: Dr. J. N. Chaudhari
Department: Mathematics
Class: M. Sc.
Title of Paper: MT-103: Algebra (Ring Theory)
MT-204: Number Theory

Faculty: Science
Academic Year: 2020-21
Subject: Mathematics

Month	Topic/s to be Covered	No. of Hours required
January	Factorization, Euclidean domains, principal ideal domains, Unique Factorization domains,	8
February	Polynomial rings, Roots of polynomials;	8
March	factorization of polynomials, Noetherian rings	6
April	Hilbert basis Theorem.	3
May	Arithmetic function of Dirichlet multiplaction, the Mobius function $\mu(n)$, The Euler function $\phi(n)$	8
June	Dirichlet product of arithmetic functions, Dirichlet inverses & the Mobius inversion formula. The Mangolt function $\wedge(n)$, Multiplicative functions, Dirichlet multiplication, The inverse of a completely multiplicative function, Liouvilles function $\lambda(n)$, The divisor function $\sigma(n)$, Generalized convolutions. Formal power series, Bell series of an arithmetical function, Bell series and Dirichlet multiplication, Derivatives of arithmetical functions, The Selberg identity.	16
July	Congrunces: Residue classes, Complete and reduced residue systems and Euler-Fermat's theorem, Polynomial congruences $mod\ p$. Lagranges theorem and its applications, Polynomial congruences with prime power moduli. The principle of cross classification. Quadratic residues, Legenre's symbol and its properties.	16
August	Evaluation of $(-1\mid p)$ and $(2\mid p)$, Gauss lemma, The Quadratic Reciprocity law and its applications, The Jacobi Symbol. Applications to Diophantine equations. The exponent of a number modulo m, Primitive roots, Primitive roots and reduced residue systems, The non-existence of primitive roots $mod\ p^n$ and $2p^n$ for odd primes p and $n\ \square\ 1$. The non-existence of primitive roots in the remaining cases. The number of primitive roots $mod\ m$. the primitive roots and quadratic residues. The index calculus.	10

Taudh.

Khandesh College Education Society's

MOOLJI JAITHA COLLEGE, JALGAON

□NAAC Reaccredited "A" Grade (CGPA 3.15) □ISO 9001:2008 Certified
□UGC honored "College of Excellence"

ESTD. 1945

TEACHING PLAN

Name of Teacher : Dr. J. N. Chaudhari   Faculty : Science

Department : Mathematics   Academic Year : 2020-21

Class : M. Sc.   Subject : Mathematics

Title of Paper : MT-106(B): Problem course based on MT-103
  MT-206(B): Problem course based on MT-204

Month	Topic/s to be Covered	No. of Hours required
January	Factorization, Euclidean domains, principal ideal domains, Unique Factorization domains,	4
February	Polynomial rings, Roots of polynomials, factorization of polynomials.	5
March	Noetherian rings, Hilbert basis Theorem.	4
May	Arithmetic function of Dirichlet multiplaction, the Mobius function $\mu(n)$, The Euler function $\phi(n)$	6
June	Dirichlet product of arithmetic functions, Dirichlet inverses & the Mobius inversion formula. The Mangolt function $\wedge(n)$, Multiplicative functions, Dirichlet multiplication, The inverse of a completely multiplicative function, Liouvilles function $\lambda(n)$, The divisor function $\sigma(n)$, Generalized convolutions. Formal power series, Bell series of an arithmetical function, Bell series and Dirichlet multiplication, Derivatives of arithmetical functions, The Selberg identity.	8
July	Congrunces: Residue classes, Complete and reduced residue systems and Euler-Fermat's theorem, Polynomial congruences $mod\ p$. Lagranges theorem and its applications, Polynomial congruences with prime power moduli. The principle of cross classification. Quadratic residues, Legenre's symbol and its properties.	8
August	Evaluation of $(-1\mid p)$ and $(2\mid p)$, Gauss lemma, The Quadratic Reciprocity law and its applications, The Jacobi Symbol. Applications to Diophantine equations. The exponent of a number modulo m, Primitive roots, Primitive roots and reduced residue systems, The non-existence of primitive roots $mod\ p^n$ and $2p^n$ for odd primes p and $n \square 1$. The non-existence of primitive roots in the remaining cases. The number of primitive roots $mod\ m$. the primitive roots and quadratic residues. The index calculus.	4

Luadh.

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: F.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH 111: Calculus

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
July		
August		
September	Epsilon-delta definition of limit of a function, Basic properties of limits, Indeterminate forms &L-Hospitals rule, Continuous functions. Properties of continuous functions on closed andbounded intervals, Theorems on Boundedness of continuous functions, including Intermediatevalue theorem, Uniform continuity.	08
October	Differentiability, Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean ValueTheorem, Geometrical interpretation and applications.	07
November	The nth derivative of some standard functions $e^{ax+b}, (ax+b)^m, x^m, \frac{1}{ax+b}, \log(ax+b), \sin(ax+b), \cos(ax+b), e^{ax}\sin(bx+b), e^{ax}\cos(bx+b)$ and Leibnitz's theorem & Examples.	08
December	Taylor's theorem with Lagrange's form of remainder and related examples, Maclaurin' theoremwith Lagrange's form of remainder and related examples, Reduction Formulae: 1) $\int_0^{\frac{\pi}{2}}\sin^n x\,dx$ 2) $\int_0^{\frac{\pi}{2}}\cos^n x\,dx$ 3) $\int_0^{\frac{\pi}{2}}\sin^m x\cos^n x\,dx$ 4) $\int_0^{\frac{\pi}{2}}\frac{\sin^n x}{\sin x}\,dx$	07

(Teacher)
Signature

(H.O.D.)
Signature

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: F.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH 113(A): Matrix Algebra

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
July		
August		
September	Elementary operations on matrices. Adjoint of a matrix & Inverse of a matrix. Existence &uniqueness theorem of inverse of a matrix. Properties of inverse of a matrix, Elementarymatrices. Rank and normal form of a matrix, Reduction of a matrix to its normal form, Rank ofproduct of two matrices.	08
October	A homogeneous and non-homogeneous system of linear equations. Consistency of system oflinear equations. Application of matrices to solve the system of linear equations.	07
November	Orthogonal matrices and properties of orthogonal matrices. Characteristic equation, Eigen valuesand Eigen vectors of matrices. Cayley Hamilton theorem (statement only) and its use to find the inverse of a Matrix.	08
December	Matrix inversion method (3x3 system), Gauss elimination method (3X3 system), Gauss Jordanmethod (3x3 system), Ill-conditioned linear systems.	07

(Teacher)
Signature

(H.O.D.)

Signature
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: F.Y.B.Sc   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH 121: Ordinary Differential Equations

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
January		
February	Partial derivatives of first order & second orders and Examples, Exact differential equations,Condition for exactness, Integrating factor, Rules for finding integrating factors, Lineardifferential equations, Bernoulli's Equation. Equation reducible to linear form.	07
March	Differential equations of first order and higher degree, Equation solvable for p, Equation solvable for y, Equation solvable for x, Clairaut's form.	08
April	Linear differential equations with constant coefficients, Complementary functions, Particular integrals of $f(D)y = X$ where $X = e^{ax}, \sin(ax), \cos(ax), x^n, e^{ax}V, xV$ with usual notations.	07
May	Homogeneous linear differential equations (Cauchy's differential equations), Example of Homogeneous linear differential equations, Equations reducible to homogeneous linear differential equations (Legendre's equations), Example of Equations reducible to homogeneous linear differential equations.	08

(Teacher)
Signature

(H.O.D.)

Signature
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: F.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH -123(B): Numerical Methods

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
January		
February	**Solution of Algebraic and Transcendental Equations:**Errors and their computation, Absolute, relative and percentage errors, The Bisection method,The iteration method, The method of false position, Newton-Raphson method.	07
March	**Interpolation with uniform intervals:** Finite differences: Forward differences, backward differences, central differences, Symbolicrelations and other difference operators, Gauss forward and backward interpolation by centraldifferences, Stirling's formula.	08
April	**Interpolation with unequal intervals:** Divided differences and Properties, Newton's divided difference formula, Lagrange'sinterpolation, inverse interpolation by Lagrange's method and Iterative method.	07
May	**Numerical Solutions of Ordinary Differential Equations:** Numerical solution of first order ODE by Taylor's series, Euler's method and Modified Euler'smethod, Runge–Kutta method, Runge–Kutta second and fourth order formulae.	08

(Teacher)
Signature

(H.O.D.)

Signature
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: S.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH-231: Calculus of several variables

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
July		
August		
September	Explicit and implicit functions, Continuity, Partial derivatives, Differentiability, Necessary and sufficient conditions for differentiability, Partial derivatives of higher order, Schwarz's theorem, Young's theorem.	10
October	Composite functions (chain rule), Homogeneous functions, Euler's theorem on homogeneous functions, Mean value theorem for functions of two variables.	10
November	Taylor's theorem for functions of two variables, Maclaurin's theorem for functions of two variables, Absolute and relative maxima & minima, Necessary condition for extrema, Critical point, Saddle point, Sufficient condition for extrema.	10
December	Double integrals by using Cartesian and polar coordinates, Change of order of integration, Area by double integral, Evaluation of triple integral as repeated integrals, Volume by triple integral.	10

(Teacher) Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: S.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH-241: Complex variables

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
January		
February	Complex numbers, Modulus and amplitude, Polar form, Triangle inequality and Argand's diagram, Riemann Sphere, De-Moivre's theorem for rational indices and applications, n^{th} roots of a complex number.	10
March	Limits, Continuity and derivative, Analytic functions, Necessary and sufficient conditions for analytic functions, Cauchy-Riemann equations, Laplace equations and Harmonic functions, Construction of analytic functions.	10
April	Line integral and theorems on it, Statement and verification of Cauchy-Gaursat's theorem, Cauchy's integral formulae (for simple connected domain) for $f(a)$, $f'(a)$ and $f^n(a)$, Taylor's and Laurent's series.	10
May	Zeros, poles and singularities of a function, Residue of a function, Cauchy's residue theorem, Evaluation of integrals by using Cauchy's residue theorem, Contour integrations of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$	10

(Teacher)
Signature

(H.O.D.)
Signature

Head
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: T.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH - 501: Metric Spaces

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
July		
August	1.1 Equivalence and Countability 1.2 Metric Spaces 1.3 Limits in Metric Spaces	9
September	2.1 Reformulation of definition of continuity in MetricSpaces. 2.2 Continuous function on Metric Spaces. 2.3 Open Sets 2.4 Closed Sets 2.4 Homeomorphisms.	9
October	3.1 More about Sets 3.2 Connected Set 3.3 Bounded and Totally bounded sets	9
November	4.1 Complete Metric Spaces 4.2 Properties of Complete Metric Spaces 4.3 Contraction Mapping on Metric Spaces.	9
December	5.1 Compact Metric Spaces. 5.2 Continuous function on compact Metric Spaces. 5.3 Continuity of inverse function 5.4 Uniform Continuity	9

(Teacher)
Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: S D Tayade

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: S.Y.B.Sc.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH - 601: Measure Theory

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
January	1.1 Length of open and closed sets 1.2 Inner and outer measure of a set 1.3 Measurable sets and Properties of measurable sets 1.4 Symmetric difference of two measurable sets 1.5 Cantor's ternary sets	9
February	2.1 Real valued measurable functions 2.2 Sequence of measurable functions 2.3 Supremum and infimum of measurable functions 2.4 Almost everywhere concept	9
March	3.1 Measurable partition, Refinement, Lower and Upper Lebesgue sum and Lebesgue integrals 3.2 Existence of Lebesgue integral for bounded function. 3.3 Properties of Lebesgue integral for bounded measurable functions 3.4 Lebesgue integral for bounded function over a set of finite measure	9
April	4.1 Non-negative valued function 4.2 Positive and negative part of a function 4.3 Definition and properties of $\int_E f$ where f is nonnegative valued function in L[a, b]	9
May	5.1 Lebesgue dominated convergence theorem 5.2 Fatou's Lemma 5.3 Square integrable function 5.4 Schwartz inequality, Minkowski inequality.	9

(Teacher)
Signature

(H.O.D.)

Head
Department of Mathematics
M.J.College,Jalgaon
Signature

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: S.Y. B.Sc.(A)

Title of Paper : MTH-232(A) Abstract algebra

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

FIRST TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
August	**Unit-1: Groups :** Definition and examples of a group, Simple properties of group, Abelian group, Finite and infinite groups, Order of a group, Order of an element and its properties.	10
September	**Unit-2: Subgroups :** Definition and examples of subgroups, Simple properties of subgroup, Criteria for a subgroup, Cyclic groups, Coset decomposition, Lagrange's theorem for finite group, Euler's theorem and Fermat's theorem.	10
October	**Unit-3: Homomorphism and Isomorphism of Groups :** Definition and examples of group homomorphism, Properties of group homomorphism, Kernel of a group homomorphism and it's properties, Definition and examples of isomorphism and properties, Definition and examples of automorphism of groups.	10
November	**Unit-4: Rings:** Definition and simple properties of a ring, Commutative ring, Ring with unity, Boolean ring, Ring with zero divisors and without zero divisors, Integral domain, Division ring & field and their simple properties.	10

(Teacher)
Signature

(H.O.D.)
Signature

Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: S.Y. B.Sc.(C)

Title of Paper : MTH-232(B) Computational algebra

Faculty : Science

Academic Year : 2020-21

Subject : Mathematics

FIRST TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
August	**Unit-1: Groups :** Definition and examples of a group, Simple properties of group, Abelian group, Finite and infinite groups, Order of a group, Order of an element and its properties.	10
September	**Unit-2: Subgroups :** Definition and examples of subgroups, Simple properties of subgroup, Criteria for a subgroup, Cyclic groups, Coset decomposition, Lagrange's theorem for finite group, Euler's theorem and Fermat's theorem.	10
October	**Unit-3: Homomorphism and Isomorphism of Groups :** Definition and examples of group homomorphism, Properties of group homomorphism, Kernel of a group homomorphism and it's properties, Definition and examples of isomorphism and properties, Definition and examples of automorphism of groups.	10
November	**Unit-4: Group Codes:** Message, Word, (m,n)- Encoding Function, Code Words. Detection of k or fewer errors, Weight, Parity Check Code, Hamming Distance, Properties of the Distance Function, Minimum Distance of an encoding function. Group Codes. (n, m)- Decoding function, Maximum Likelihood Decoding Function. Decoding procedure for a Group Code given by a Parity Check Matrix.	10

(Teacher)
Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: S.Y. B.Sc.(A)

Title of Paper : MTH-242(A) Differential equations

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

SECOND TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
February	**Unit-1: Theory of ordinary differential equations:** Lipschitz condition, Existence and uniqueness theorem, Linearly dependent and independent solutions, Definition of Wronskian and properties related to solution of L.D.E., Super position principle. Method of variation of parameters for second order L.D.E.	10
March	**Unit-2: Simultaneous Differential Equations :** Simultaneous linear differential equations of first order, Simultaneous D.E. of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$, Rule I: Method of combinations, Rule II: Method of multipliers, Rule III: Properties of ratios.	10
April	**Unit-3: Total Differential or Pfaffian Differential Equations:** Pfaffian differential equations, Necessary and sufficient conditions for the integrability, Conditions for exactness, Method of solution by inspection, Solution of homogenous equation.	10
May	**Unit-4: Difference Equations:** Introduction, Order of difference equation, Degree of difference equations, Solution to difference equation and formation of difference equations, Linear difference equations, Linear homogeneous difference equations with constant coefficients, Non-homogenous linear difference equation with constant coefficients viz. a^x and $f(x)$ (a polynomial of degree m).	10

(Teacher)

Signature

(H.O.D.)

Head,

Department Signature Mathematics

M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: T.Y. B.Sc

Title of Paper : MTH-503 Algebra

Faculty : Science

Academic Year : 2020-21

Subject : Mathematics

FIRST TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
August	**Unit-1: Permutation Group**: Definitions: Permutation, Cycle, Transposition, Permutations as a product of disjoint cycles and transpositions, Even and odd permutations, Permutation Groups, Alternating Groups. **Unit-2: Normal Subgroup**: Normal Subgroup, Criterions for a subgroup to be a normal subgroup, Union and Intersection of normal subgroups.	12
September	Quotient Group, Simple Group, Cyclic group, Commutator subgroup, Group homomorphism. **Unit-3: Isomorphism Theorems for Groups**: Revision of Homomorphism and Isomorphism of Groups, Isomorphism theorems for groups and examples, Cayley's theorem, Theorem: $O(A_n) = \frac{o(s_n)}{2}$, Automorphism and inner Automorphism.	12
October	**Unit-4: Ideals, Quotient Rings and Isomorphism of Rings**: Revision of Ring, integral domain, field and basic properties, Characteristics of a ring. Subrings, ideals, left ideals, right ideals, principal ideals, prime ideals, maximal ideals, Quotient rings, Quotients field, Homomorphism and Isomorphism theorems for rings.	12
November	**Unit-5: Polynomial Rings**: Definition and Properties of polynomial rings, Roots of polynomials, Factorization of polynomials, Division Algorithm for polynomials, Eisenstein's Criterion and other irreducible criterion.	9

(Teacher)
Signature

(H.O.D.)
Signature
Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: T.Y. B.Sc

Title of Paper : MTH-504 Lattice Theory

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

FIRST TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
August	**Unit-1: Posets:** Posets and Chains, Diagrammatical Representation of posets, Maximal and Minimal elements of subset of a poset, Zorn's Lemma, Supremum and infimum Poset isomorphism, Duality Principle. **Unit-2: Lattices:** Two definitions of lattice and equivalence of two definitions.	12
September	Modular and Distributive inequalities in a lattice, Sublattice and Semilattice, Complete lattice. **Unit-3: Ideals:** Ideals ,Union and intersection of Ideals, Prime Ideals, Principal Ideals, Dual Ideals, Principal dual Ideals.	12
October	Complements , Relative Complements. **Unit-4: Homomorphisms and Modular Lattices:** Homomorphisms, Join and meet homomorphism, Definition of Kernel, Properties of Kernels, Modular lattice, Sublattice of Modular lattice, Homomorphic image of Modular lattice.	12
November	**Unit-5: Distributive lattices and Boolean Lattice:** Distributive lattice, Relation between Modular and Distributive Lattices, Sublattice of distributive lattice, Homomorphic image of distributive lattice, Complemented and Relatively complemented Lattice, Definition Boolean Lattice, Properties of Boolean lattice.	9

(Teacher)
Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: T.Y. B.Sc

Title of Paper : MTH-602 Real Analysis-II

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

SECOND TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
February	**Unit-1: Sequence of real numbers**: Definition of sequence and subsequence of real numbers, Convergent Sequence, Divergent Sequences, Monotone sequence, Operation on Convergent Sequences, Cauchy Sequences. **Unit-2: Series of real numbers:** Convergence and divergence, Series with non-negative terms.	13
March	Alternating series, Conditional convergence and absolute convergence, Test for absolute convergence, Series whose terms form non-increasing sequence. **Unit-3: Sequence of functions:** Pointwise convergence of sequence of functions, Uniform convergence of sequence of functions,	13
April	Cauchy's criteria for uniform convergence of sequence of functions, Consequences of uniform convergence. **Unit-4: Series of functions**: Pointwise convergence of series of functions, Uniform convergence of series of functions, Integration and differentiation of series of functions, Abel's sumability.	12
May	**Unit-5: Fourier series in the range (-$\square$, $\square$):** Fourier series and Fourier coefficients, Dirichlet's condition of convergence, Fourier series for even and odd functions, Sine and cosine series in half range.	7

(Teacher)

Signature

(H.O.D.)

Signature

Head
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: T.Y. B.Sc

Title of Paper : MTH-606(B) Operations Research

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

SECOND TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
February	**Unit-1: Linear programming problem (LPP):** Formation of LPP, Solution of LPP by graphical method, Special cases in LPP: a) Unbounded solution b) Alternate solution c) Infeasible solution, Standard and Canonical forms of LPP. **Unit-2: Simplex Methods:** Simplex algorithm, Solution of LPP by simplex method, Artificial variable technique (Big M method).	13
March	Special cases in LPP: a) Unbounded solution b) Alternate solution c) Infeasible solution. **Unit-3: Transportation Problem:** General Transportation Problem, Transportation Table, Methods for finding IBFS : a) North –West corner rule. b) Matrix minima method (Least cost method) c) Vogel's approximation method (VAM), Optimality test and optimization of solution to TP by U-V method (MODI).	13
April	Special cases in TP : a) Alternate solution b) Maximization of TP c) Degeneracy in solving TP d) Restricted transportation problems. **Unit-4: Assignment problem (AP):** Mathematical formulation of Assignment problem, Hungarian method for solving AP, Special cases in AP: a) Alternate solution b) Maximization AP. c) Restricted AP.	12
May	**Unit-5: Game Theory:** Two person-zero sum games, Pure and mixed strategies, value of a game, Maxmin and Minimax principles and saddle point, Solution of 2X2 game by algebraic method and oddment method, Game without saddle points- mixed strategies, Graphical solution of mX2 and 2Xn games, Dominance Property.	7

(Teacher)

Signature

(H.O.D.)

Signature

Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in
TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: M.Sc.-I

Title of Paper : MT-102 Advanced metric spaces

Faculty : Science

Academic Year : 2020-21

Subject : Mathematics

FIRST TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
February	**Unit I: Metric spaces:** Partially ordered sets, well ordered sets, Axiom of choice, Zorn's lemma, Well ordering principle	12
March	Metric spaces, open sphere, open sets. **Unit II: Complete metric spaces:** Sequences of metric spaces, Cauchy sequences, convergence, Completeness, Bair's Theorem	16
April	Completion of metric spaces. **Unit III: Compact metric spaces:** Continuity, Homeomorphism, Isometry, Compactness, totally bounded sets, Arzela Ascoli theorem, Contraction principle	16
May	Existence theorem for differential equations. **Unit IV: Connected metric spaces:** Connected spaces, connected sets in ℝ, finite product of connected spaces	16

(Teacher)
Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher : Dr. Kunal Julal Ingale

Department: Mathematics

Class: M.Sc.-II

Title of Paper : MT-404 Advanced ring theory

Faculty   : Science

Academic Year : 2020-21

Subject : Mathematics

SECOND TERM

Month	Theory / Practicals to be covered	No. of Lectures Required
February	**Unit I: Ideal Theory:** Basic concepts of maximal ideals, prime ideals and nil radical of an ideal, semiprime ideals, primary ideals, Prime avoidance theorem.	15
March	**Unit II: Certain Radicals of a Ring:** Jacobson radical of a ring, Semisimple ring, Prime radical of a ring, Quasi-regular element, J-radical, J-semisimple ring, Regular ring.	15
April	**Unit III: Direct sum of rings:** Direct sum of rings, Subdirectly reducible and irreducible rings	15
May	**Unit IV: Primary decomposition in rings:** Introduction of irreducible ideals, irredundant primary representation, Cohen's theorem, Krull's intersection theorem.	15

(Teacher)
Signature

(H.O.D.)
Signature
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: S.Y.B.Sc.(SEC)   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH-230: Set theory and logic

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
June		
July		
August	Finite set and infinite set, Equality of two sets, Null set, Subset, Proper subset	04
September	Symmetric difference of two sets, Universal set, Power set, Disjoint sets, Operation on sets such as union and intersection, Venn diagram, Equivalent sets, Countable and uncountable sets	06
October	Product of sets, Relations, Types of relations, Reflexive, Symmetric, Transitive relations and equivalence relations, Function, Types of functions, One-one, Onto, Even, Odd and inverse function, Composite functions.	10
November	Statements, Conjunction, Disjunction, Negation, Conditional and bi-conditional statements, Propositions, Truth table, Tautology and contradiction, Logical equivalence, Logical equivalent statements.	10
December	Propositional functions and truth sets, Universal quantifier, Existential quantifier, Negation of proposition which contain quantifiers, Counter examples.	10

(Teacher)
Signature

(H.O.D.)
Signature
Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science

DEPARTMENT: Mathematics

CLASS: S.Y.B.Sc.(SEC)

SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH-240: Graph theory

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
November		
December	Product of Vectors: Scalar Product, Vector Product, Scalar Triple Product, Vector Product of Three Vectors, Reciprocal Vector.	07
January	Vector functions: Vector functions of a single variable, Limits and continuity, Differentiability, Algebra of differentiation, Curves in space, Velocity and acceleration, Vector function of two or three variables, Limits, Continuity, Partial Differentiation.	08
February	Vector Operator Del: The vector differentiation operator del, Gradient, Divergence and curl, Formulae involving del. Invariance.	07
March	Vector Integration: Ordinary integrals of vectors, Line integrals, Surface integrals.	08

(Teacher)
Signature

(H.O.D.)
Head Signature
Department Of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science

CLASS: T.Y.B.Sc.

DEPARTMENT: Mathematics

SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH - 502: Real Analysis –I

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
June		
July		
August	Riemann Integration: Definition and Existence of the Integral, The meaning of $\int_a^b f\,dx$ when $a \leq b$, Inequalities for integrals, Refinement of partitions, Darboux's Theorem (without proof), Conditions of integrability, Integrability of the sum and difference of integrable functions, The integral as a limit of sum (Riemann Sums) and the limit of sum as the integral and its applications, Some Integrable functions.	09
September	Mean value theorems of integral calculus: The First mean value theorem, The generalized First mean value theorem, Abel's lemma (without proof), Second mean value theorem. Bonnets form and Karl Weierstrass form	09
October	Improper integrals with finite limit: Integration of unbounded functions with finite limits of Integral, Comparison Test for convergence at a of $\int_a^b f\,dx$, Convergence of the improper integrals $\int_a^b \frac{dx}{(x-a)^n}$ Cauchy's general test for convergence at the point a of $\int_a^b f\,dx$, Absolute convergence of the improper integrals $\int_a^b f\,dx$.	09
November	Improper integrals with infinite limit: Convergence of the integral with infinite range of Integration, Comparison Test for convergence at ∞, Convergence at a of $\int_a^\infty \frac{dx}{x^n}$, $(a > 0)$, Cauchy's General Test for convergence at ∞, Absolute convergence of $\int_a^\infty f\,dx$, Test for absolute convergence of $\int_a^\infty f\,dx$, Abel's Test and Dirichlet's Test for convergence of $\int_a^\infty f\,dx$	09
December	Beta and Gamma Integrals: Convergence of Beta and Gamma Integrals, Properties of Beta and Gamma Functions, Relation between Beta and Gamma Functions, Duplication Formula, Evaluation of integrals using Beta and Gamma Integrals.	09

(Teacher)

Signature

(H.O.D.)

Signature

Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science DEPARTMENT: Mathematics

CLASS: T.Y.B.Sc. SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MTH - 605: Graph Theory

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
January		
February	Graphs: Definition, Handshaking lemma, Types of graph, Subgraphs, Operations on graphs, Isomorphism of graphs, Walk path cycles, (circuit)	11
March	Connected and disconnected graphs, Eulerian graphs, Konigsberg seven bridge problem, Hamiltonian graph, Traveling salesman problem, Definition and properties of a tree, Distance and center in a tree	12
April	Rooted and binary trees, Spanning tree, Cut sets, edge connectivity, vertex connectivity, Fundamental Cut set, fundamental circuits, Planar graph, Eulers formula for planar graph	11
May	Geometrical dual, Coloring of a graph, Incidence matrix, Adjacency matrix, Types of diagraph, Incidence matrix of a diagraph, Adjacency matrix of a diagraph	11

(Teacher)

Signature

(H.O.D.)

Signature
Head
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: M.Sc.(Sr.)   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MT-301: Functional Analysis

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
June		
July		
August	**Banach spaces:** Normed linear spaces, Banach Spaces, Quotient spaces, Continuous linear Transformations, The Hahn-Banach theorem and its consequences, conjugate space and separability, Second conjugate space, The natural embedding of normed linear space and its second conjugate space	12
September	Weak* Topology on conjugate space, The open mapping theorem, Projection on Banach space, The closed graph theorem, the conjugate of an operator, The uniform boundedness theorem (Banach-Steinhauss theorem).	13
October	**Hilbert spaces:** Inner Product spaces, Hilbert space, Schwartz's inequality, Orthogonal complements, Projection theorem, Orthogonal sets, The Bessel's inequality, Fourier expansion and Parseval's equations.	12
November	Gram-Schmidt orthogonalization process, Separable Hilbert space, The conjugate space, Riesz-Representation theorem, Operators and their adjoints on a Hilbert space, self adjoint operators, Normal and unitary operators.	13
December	**Spectral theory:** Finite dimensional spectral theory, Determinants and spectrum of an operator, The spectral theorem, Fixed points, Definition and examples, Banach contraction mapping theorem, Brouwer's fixed point theorem, Schauder's fixed point theorem.	10

(Teacher)

Signature

(H.O.D.)

Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: M.Sc.(Sr.)   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MT-303: Field Theory

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
June		
July		
August	Field extensions: Finite extensions, Algebraic extensions, Simple extensions, Algebraic closure, Algebraically closed field, Splitting field.	10
September	Normal extension, Conjugate elements, Separable polynomial, Separable extension.	10
October	Purely inseparable elements, inseparable extensions, Perfect fields, Finite fields.	10
November	Galois extension, Galois group, Artin's theorem, Fundamental theorem of Galois theory, primitive n^{th} roots of unity, Cyclic extensions.	15
December	Simple radical extension, Radical extension, Galois group of a polynomial, Constructible number, Radical extension of type 2, Geometric constructions, Algebraically independent set, finitely generated extension, Transcendental basis, Transcendental extension, Purely transcendental extension.	15

(Teacher)
Signature

(H.O.D.)
Signature
Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: M.Sc.(Jr.)   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MT-203: Linear Algebra

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
November		
December	Modules, Submodules, R-homomorphism, Isomorphism, Direct sum of modules	12
January	free modules, Rank, Structure theorem for finitely generated modules over PID, Application to group Theorem.	12
February	Diagonalization and Triangularization of operators, Jordan & Rational Canonical forms.	12
March	Noetherian Modules, primary decomposition for modules.	04

(Teacher)
Signature

(H.O.D.)
Signature

TEACHING PLAN

ACADEMICYEAR: 2020-21

NAME OF TEACHER: Dr. Hemant Premraj Bendale

FACULTY: Science   DEPARTMENT: Mathematics

CLASS: M.Sc.Sr.   SUBJECT: Mathematics

PAPER CODE and TITLE OF PAPER: MT-403: Commutative Algebra

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED
November		
December	Modules, Free modules, Projective modules, Tensor product and Flat modules	15
January	Noetherian modules, Primary decomposition, Artinian modules	15
February	Integral extensions: Integral elements, Integral extensions and Integrally closed domain.	15
March	Dedekind domain: Valuation rings, Discrete valuation rings and Dedekind domains	15

(Teacher)

Signature

(H.O.D.)
Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Samir Kushabrao Patil**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: F.Y.B.Sc. (Sem-I)	Subject	: Mathematics
Title of Paper	: MTH-112 Coordinate geometry		

Month	Topic/s to be Covered	No. of Lectures Required
November	Change of axes, Translation and Rotation, Invariants, Conic section, General equation of second degree in two variables.	06
December	Reduction to standard form, Equation of sphere in different forms, Plane section of sphere, Tangent line and Tangent plane to sphere, Condition of tangency and point of contact.	08
January	Interpretation of $S + \lambda S = 0$ and $S + \lambda U = 0$ with usual notations, Equation of cone with vertex at origin, Equation of cone with vertex at (α, β, γ), Right circular cone.	08
February	Enveloping cone of sphere, Tangent line and tangent plane to the cone, Definition and Equation of cylinder, Right circular cylinder, Enveloping cylinder.	08

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

TEACHING PLAN

Name of Teacher	: **Mr. Samir Kushabrao Patil**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: F.Y.B.Sc. (Sem-I)	Subject	: Mathematics
Title of Paper	: MTH-113(B) Applied Matrix Algebra		

Month	Topic/s to be Covered	No. of Lectures Required
October	Elementary operations on matrices, Adjoint of a matrix & Inverse of a matrix.	02
November	Existence &uniqueness theorem of inverse of a matrix, Properties of inverse of a matrix, Elementary matrices, Rank and normal form of a matrix, Reduction of a matrix to its normal form, Rank of product of two matrices, A homogeneous system of linear equations.	08
December	Non-homogeneous system of linear equations, Consistency of system of linear equations, Application of matrices to solve the system of linear equations, Orthogonal matrices and properties of orthogonal matrices.	08
January	Characteristic equation, Eigen values and Eigen vectors of matrices, Cayley Hamilton theorem (statement only) and its use to find the inverse of a Matrix, Two & Three-dimensional Matrix Transform, Application of matrices to Scaling & Shearing.	08
February	Application of Matrices to Reflection, Rotation & Translation.	04

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	:	**Mr. Samir Kushabrao Patil**		Faculty	:	Science
Department	:	Mathematics		Academic Year	:	2020-2021
Class	:	F.Y.B.Sc. (Sem-II)		Subject	:	Mathematics
Title of Paper	:	MTH-123(B) Numerical Method				

Month	Topic/s to be Covered	No. of Lectures Required
June	Errors and their computation, Absolute, relative and percentage errors, The Bisection method, iteration method, The method of false position, Newton-Raphson method, Finite differences, Forward differences, backward differences, central differences, Symbolic relations and other difference operators, Gauss forward and backward interpolation by central differences.	14
July	Stirling's formula, Divided differences and Properties, Newton's divided difference formula, Lagrange's interpolation, inverse interpolation by Lagrange's method and Iterative method, Least squares curve fitting procedures, Fitting of straight line, Non-linear curve fitting: power function $y = ax + b$, Fitting polynomial of degree two $y = a + bx + cx^2$.	14
August	Fitting of exponential $y = ae^{bx}$.	02

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	:	**Mr. Samir Kushabrao Patil**	Faculty	:	Science
Department	:	Mathematics	Academic Year	:	2020-2021
Class	:	F.Y.B.Com. (Sem-II)	Subject	:	Mathematics
Title of Paper	:	BCOM-125 Quantitative Techniques			

Month	Topic/s to be Covered	No. of Lectures Required
June	Calculation of Interest, Meaning of an annuity, Types of an annuity:- annuity due, annuity regular, Present value and future value of an annuity, Sinking fund, Mathematical Logic, Meaning of statement, Truth value of a statement, Elementary and compound statements, Law of excluded middle, Negation, Conjunction, Disjunction, Implication and double implication, Construction of truth table, Equivalence of logical statements, Tautology and Contradiction.	06
July	Permutation, Combination & Sets, permutation and combination, Meaning of permutation and combination, Fundamental principle of counting, Meaning of Factorial of a number. Statement of basic properties of factorial of a number, Statement of formula for number of permutations of n different objects when r objects are taken at a time, Statement of formula for number of combinations of n different objects taken r at a time, Simple numerical problems from real life situations.	12
August	Meaning of a set, Methods of describing a set, finite set, infinite set, empty set, universal set, subset, super set, disjoint sets, overlapping sets, complementary set, equality of two sets, union of sets, intersection of sets, difference of two sets, Statement of Demorgan's laws, Venn diagrams, Use of Venn diagrams in logic, Statement and verification by Venn diagrams of following basic results relating to number of elements of a finite set, Simple numerical problems illustrating commercial applications.	06

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3ʳᵈ Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Samir Kushabrao Patil**	Faculty	:	Science
Department	: Mathematics	Academic Year	:	2020-2021
Class	: M.Sc. (Sem-I)	Subject	:	Mathematics
Title of Paper	: MT-101 Measure Theory			

Month	Topic/s to be Covered	No. of Lectures Required
February	Countable and uncountable sets, Infinite sets and the axioms of choice, Cardinal numbers and their arithmetic, Schroeder- Bernstein theorem, Cantors theorem and the continuum Hypothesis, Zorn's lemma, Well Ordering principle, Cantor set, Cantor like sets, The Lebesgue functions.	09
March	Measure on the real line, Lebesgue outer measure, Measurable sets, Regularity, Measurable functions, Borel sets and Lebesgue measurability.	16
April	Integration of functions of a real variable: Integration of nonnegative function, The general integral, Integration of series, Riemann and Lebesgue integrals.	16
May	The four derivatives. Functions of bounded variation. Lebesgue differentiation theorem, Differentiation and Integration, Differentiation of monotone function: Vitali covering theorem (lemma), Fundamental theorem for integral calculus for Lebesgue integral, Absolutely continuous functions.	19

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Samir Kushabrao Patil**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: M.Sc. (Sem-II)	Subject	: Mathematics
Title of Paper	: MT-205 (A) Mathematical Method		

Month	Topic/s to be Covered	No. of Lectures Required
May	Introduction, derivation of wave equation, heat equation and Laplace's equation in Cartesian, cylindrical and spherical co-ordinates. Principle of superposition, series solutions, separation of variables, types of initial value problems and general solution of partial differential equation, Orthogonality of sets of functions in the space of piecewise continuous functions on (a, b), generalized Fourier Series.	16
June	Approximation in the mean, closed and complete orthonormal sets, Fourier series and half range Fourier series, Sturm-Liouville problems, orthogonality of the eigen functions and their uniqueness, boundary value problems involving the wave equation, heat equation and Dirichlet's problems, Solution by the method of separation of variables.	16
July	Temperature in along Cylinder, heat transfer at the surface of the cylinder and vibrations of the circular membrane, Bessel's differential equation and its solution, Bessel function of first kind, second kind, Bessel functions of order zero and one, recurrence relations.	20
August	Generating function, orthogonality of Bessel functions, Fourier Bessel Series.	08

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr.Samir Kushabrao Patil**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: M.Sc. (Sem-III)	Subject	: Mathematics
Title of Paper	: MT-302 Advanced numerical methods		

Month	Topic/s to be Covered	No. of Lectures Required
August	Methods of triangularization – Do little algorithm, Crout's method, inverse of a matrix by Crout's method, Gauss Jordan method for system of linear equations, Iterative methods of Jacobi and Gauss–Seidal, Relaxation method, convergence.	12
September	Numerical differentiation using Forward, Backward, Central differences, Error analysis, higher derivatives of continuous and tabulated functions, maximum and minimum values of a function, difference tables and Richardson's extrapolation. Newton–Cotes Integration formulas, Trapezoidal rule, Simpson's 13-rule, Error Analysis, Romberg integration, Numerical Double integration by trapezoidal and Simpson's rules, Initial value problems, Numerical Solution of O.D.E using Picard, Taylor series.	16
October	Modified Euler and Runge-Kutta fourth order methods, Predictor corrector methods. Linear BVP, shooting method, alternative method, Finite difference method of linear second order problems, derivative boundary condition, solution of tri-diagonal system, Introduction, deriving difference equations.	16
November	Numerical solution of elliptic equations, Leibnitz's iteration method for Laplace equation and Poisson's equation, Solution of Heat equation, Bendor-Schmidt method, Crank-Nicholson method.	12
December	Hyperbolic equations, finite difference method and starting values.	04

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

Name of Teacher	:	**Mr. Samir Kushabrao Patil**	Faculty : Science	
Department	:	Mathematics	Academic Year : 2020-2021	
Class	:	M.Sc. (Sem-IV)	Subject : Mathematics	
Title of Paper	:	MT-401 Linear integral equations		

Month	Topic/s to be Covered	No. of Lectures Required
March	Types of Integral equations, Types of linear integral equations: First kind, Second kind, Third kind, Homogeneous, Non-homogeneous, Types of kernels: Symmetric kernel, Separable kernel or Degenerate kernel, Iterated kernel, Resolvent kernel or Reciprocal kernel, Classification of Integral Equations: Fredholm integral equation, Volterra integral equation, Volterra-Fredholm integral equation, Singular integral equation, Definition and Classification of Integro-Differential Equations: Fredholm Integro-Differential Equations, Volterra Integro-Differential Equations, Volterra-Fredholm Integro-Differential Equations, Eigen value and Eigen function.	10
April	Leibnitz Rule for Differentiation of Integrals, Reducing Multiple Integrals to Single Integrals, Converting IVP to Volterra Integral Equation, Converting Volterra Integral Equation to IVP, Converting BVP to Fredholm Integral Equation, Converting Fredholm Integral Equation to BVP, Solution of an Integral Equation, Conversion to a Volterra equation of the first kind to second kind, Adomian decomposition, Modified Decomposition, Successive Approximations.	16
May	Approximations, Neumann Series, Successive Substitution, The Laplace Transform Methods, The Direct Computation Method, Resolvent kernel of Fredholm equations and its properties, Fundamental properties of Eigen values.	16
June	Eigen functions for symmetric kernels, Expansion in Eigen functions and Bilinear form, Hilbert Schmidt Theorem and its consequences, Solution of symmetric integral equations.	16
July	Solution of symmetric integral equations.	02

Teacher

H.O.D,
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	:	**Mr. Deepak Damodhar Pathave**	Faculty	:	Science
Department	:	Mathematics	Academic Year	:	2020-2021
Class	:	F.Y.B.Sc. (Sem-II)	Subject	:	Mathematics
Title of Paper	:	MTH-122 Theory of Equations			

Month	Topic/s to be Covered	No. of Lectures Required
June	Natural numbers, well ordering principal (Statement only), principle of mathematical induction, Divisibility of integers and theorems, Division algorithm, GCD and LCM, Euclidean algorithm, Unique factorization theorem, Revision of Polynomials, Horner's method of synthetic division, Existence and uniqueness of GCD of two polynomials, Polynomial equations, Factor theorem and generalized factor theorem for polynomials, Fundamental theorem of algebra (Statement only).	14
July	Methods to find common roots of polynomial equation, Descarte's rule of signs, Newton's method of divisors for the integral roots, Relation between roots and coefficient of general polynomial equation in one variable, Relation between roots and coefficient of quadratic, cubic and Biquadratic equations, Symmetric functions of roots, Transformation of equations, Cardon's method of solving cubic equations, Biquadratic equations.	14
August	Descarte's method of solving Biquadratic equations.	02

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College,Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Deepak Damodhar Pathave**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: T.Y.B.Sc. (Sem-I)	Subject	: Mathematics
Title of Paper	: MTH-505 Integral Transforms		

Month	Topic/s to be Covered	No. of Lectures Required
August	Complex and exponential form of Fourier series, Fourier Integrals, Equivalent form of Fourier integral, Sine and cosine integrals, Fourier transforms, Fourier cosine transforms.	08
September	Fourier sine transforms, Useful result for evaluating the integral in Fourier transforms, Inverse Fourier transforms, Inverse sine transforms, Inverse cosine transforms, Modulation theorem, Convolution theorem.	12
October	Finite Fourier transforms, Finite Fourier cosine transforms, Finite Fourier sine transforms, Fourier transform of the derivatives of a function, Application of Fourier transform to boundary value problem, Basic preliminary Z-transforms, Inverse Z-transform.	12
November	Z-transform pair, Uniqueness of inverse Z-transform, Properties of Z-transforms, Power series method, Partial fraction method.	09
December	Inverse integral method, Solution of difference equations with constant coefficients using Z-transform.	04

Teacher

H.O.D.
**Head,
Department of Mathematics
M.J.College, Jalgaon**

TEACHING PLAN

Name of Teacher	:	**Mr. Deepak Damodhar Pathave**	Faculty	:	Science
Department	:	Mathematics	Academic Year	:	2020-2021
Class	:	T.Y.B.Sc. (Sem-II)	Subject	:	Mathematics
Title of Paper	:	MTH-604 Ordinary & Partial Differential Equations			

Month	Topic/s to be Covered	No. of Lectures Required
February	Definition, Condition of exactness of a linear differential equation of order n, Working rule for solving exact differential equations, examples of type –I, Integrating factor, examples of type –II, Exactness of non-linear equations, Solution by trial, examples of type –III, Equation of the form $\frac{d^n y}{dx^n} = f(x)$, example on type – IV, Equation of the form $\frac{d^2 y}{dx^2} = f(y)$.	09
March	The standard form of linear differential equation of second order, Complete solution in terms of one known integral belonging to C.F., Rules for getting an integral belong to C.F., working rule for finding complete solution when an integral of C.F. is known, Removal of first derivative (reduction to normal form) working rule for solving problem by using normal form, Transformation of the equation by changing the independent variable, working rule, Definition of partial differential equation, order and degree of partial differential Equation.	12
April	Derivation of partial differential equation by elimination of arbitrary constants and arbitrary functions, Lagrange's equations and Lagrange's method of solving $Pp + Qq = R$, Integral surface passing through a given curve, Surfaces orthogonal to a given system of surfaces and examples, Compatible system of first order equations.	12
May	Condition for system of two first order partial differential equation to be compatible and examples, Particular case and examples, Charpit's method and examples, Special type (a)Involving only and Ù (b)Equation not containing the independent variable (c) Separable equation, Examples on (a), (b) and(c), Jacobi's method and examples.	12

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Deepak Damodhar Pathave**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2020-2021
Class	: M.Sc. (Sem-I)	Subject	: Mathematics
Title of Paper	: MT-105(B) Numerical Methods		

Month	Topic/s to be Covered	No. of Lectures Required
February	Introduction to matrices, various types of matrices, norm of a matrix, direct methods like Gauss elimination, Gauss-Jordan, Triangularisation methods like Crout's method, Do-Little method, Cholesky's method, error analysis for direct methods.	15
March	Eigen values and eigen vectors, bounds on eigen values, Jacobi's method, Given's method and Householder's method for symmetric matrices, power method, inverse power method, initial value problems,	18
April	Numerical Solution of O.D.E using Picard, Taylor series, modified Euler and RungeKutta fourth order methods, introduction to BVP, Initial value problem method.	18
May	Finite difference methods and finite element methods.	09

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College,Jalgaon

TEACHING PLAN

Name of Teacher	:	**Mr. Deepak Damodhar Pathave**	Faculty	:	Science
Department	:	Mathematics	Academic Year	:	2020-2021
Class	:	M.Sc. (Sem-II)	Subject	:	Mathematics
Title of Paper	:	MT-202 Topology			

Month	Topic/s to be Covered	No. of Lectures Required
May	Topological spaces, basis for topology, order topology, subspace topology, closed sets and limit points, continuous functions, product topology, continuous functions, metric topology, quotient topology.	20
June	Connected spaces, connected sets in the real line, components and path components, local connectedness compact spaces, limit point compactness, countability axioms, separation axioms.	20
July	Urysohn lemma, Urysohn metrization theorem, Tychonoff theorem, completely regular spaces.	20

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon

K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON
"An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon"
NAAC Reaccredited "A" Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured "College of Excellence"
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

Name of Teacher	: **Mr. Deepak Damodhar Pathave**	Faculty	: Science
Department	: Mathematics	Academic Year	: 2021-2022
Class	: M.Sc. (Sem-III)	Subject	: Mathematics
Title of Paper	: MT-305(A) Combinatorics		

Month	Topic/s to be Covered	No. of Lectures Required
August	Counting principles, arrangements and selections, arrangements and selection with repetition, distributions.	12
September	Binomial identities, generating function models, calculating coefficients of generating functions, partitions, exponential generating functions.	16
October	Summation method, recurrence relation models, divide and conquer relations, solution of linear and inhomogeneous recurrence relation.	16
November	Solution with generating functions, counting with Venn diagrams, inclusion – exclusion formula, restricted positions.	12
December	Rook polynomials.	04

Teacher

H.O.D.
**Head,
Department of Mathematics
M.J.College, Jalgaon**

TEACHING PLAN

Name of Teacher	:	**Mr. Deepak Damodhar Pathave**	Faculty	:	Science
Department	:	Mathematics	Academic Year	:	2020-2021
Class	:	M.Sc. (Sem-IV)	Subject	:	Mathematics
Title of Paper	:	MT-405(A) Graph theory			

Month	Topic/s to be Covered	No. of Lectures Required
March	Definition and examples, graphs as models, subgraphs, Operations on graphs, Matrix representation of graphs, walks, Trails, Paths and Cycles.	06
April	Connectedness and connectedness algorithm, definition and simple properties of a tree, bridges, spanning trees, Cayley's theorem, Kruskal's algorithm, Prim's algorithm, Shortest path problems, Breadth First Search (BFS) algorithm, backtracing algorithm, Dijkstra's Algorithm, Cut vertices, Connectivity.	16
May	Eulerian trails, Eulerian and semi-Eulerian graphs, Fleury's algorithm, Chinese postman problem, Hamiltonian graphs, Dirac theorem, closure of a graph, Bondy and Chavatal theorem, Travelling salesman problem, matching and augmenting paths, Berge theorem, Hall's marriage problem.	16
June	Personnel assignment problem and matching algorithm for bipartite graphs, The Hungarian algorithm, Plane and planar graphs, Euler's formula, vertex coloring, critical graphs, cliques and edge coloring of graphs, definition of Cayley graph, groups and graphs.	16
July	Symmetry and regularity of graphs	06

Teacher

H.O.D.
Head,
Department of Mathematics
M.J.College, Jalgaon