

GOVT. BILASA GIRLS' P.G. (Auto.) COLLEGE

Link Road, Bilaspur (C.G.)

Phone No. : 07752-224249, Website : www.bilasagrilscollege.ac.in



SYLLABUS

M.Sc. Mathematics
Semester - I & II

2021-22



DEPARTMENT OF MATHEMATICS

**"Regulation for Examination (Semester System)
At Post Graduate Level, Under Autonomous Scheme"
Session : 2021-22**

Bilaspur Universtiy, Bilaspur (C.G.) vide letter No. 277/Bub/Acad/2012dated 12/9/2012 has granted affiliation to the Govt. Girls' P.G. College, Bilaspur (C.G.) Further the University Grants Commission, New Delhi vide letter No. F-22.01.2005 (Desk-AC) December 2005 and Guru Ghasidas University, Bilaspur (C.G.) vide letter No. 81/CDC/Auto/2006 dated 22.05.2006 have extended the autonomous Govt. Girls' P.G. College upto 2011 which has been again extended till the session 2016-17 vide letter No. UGC F-22-1/2011 AC January 2012 and now UGC conferred Autonomy upto 2023. The University has authorized Govt. Girls' P.G. College, Bilaspur (C.G.) to frame syllabus and conduct examination in the following faculties the subjects at the Post Graduate level.

FACULTY

SUBJECT

I. Arts

- | | |
|-------------------|---------------------------|
| 1. M.A. Economics | 2. M.A. English |
| 3. M.A. Geography | 4. M.A. Hindi |
| 5. M.A. History | 6. M.A. Political Science |
| 7. M.A. Sociology | 8. M.A. Urdu. |
| | 9. M.A. Psychology |

II. Science Faculty

1. M.Sc. Botany
2. M.Sc. Chemistry
3. M.Sc. Food & Nutrition
4. M.Sc. Human Deveiopment
5. M.Sc. Mathematics
6. M.Sc. Physics
7. M.Sc. Zoology
8. P.G. Diploma in Computer Science.

III. Commerce

1. M.Com.

IV. BJLib. I.Sc.

1. As per the decision taken by the Co-ordination Committee in its Eleventh meeting, and in compliance of the order issued by the Directorate of Higher Education, vide letter No. 341/187/CHE/Co-ord/06 dated 27.04.2006 Govt. Girls' P.G. College Bilaspur (C.G.) is semester system of examination from the session 2007 at post Graduate Level.
2. The course, of siudy at the post Graduate Level (Master of Science, Master of Arts and Master of Commerce) is extended over four semesters in two academic Sessions. Examination of the first & Second semesters will be held in the first academic session and the third and fourth semesters in the second academic session.
3. Practical Examination of the science Faculty / Subjects will be held with the theory examination in each semester, where as Viva-Voce Examination of Arts and Commerce Faculty will be held with the theory examination of second and fourth semester.

ADMISSION:

4. The admission in the Post Graduate Classes shall be strictly on merit basis in accordance to the admission rules of Govt. of Chhattisgarh State.
5. A graduate from any recognized University of Chhattisgarh State is eligible for admission in the Post Graduate Classes. A graduate from any recognized University outside of the Chhattisgarh state will also be eligible for admission in the Post Graduate Classes provided, she fulfills all other conditions of eligibility.

SYLLABUS:

6. Each course shall be framed and approved by the Board of studies of that subject and Academic Council of the college.
7. There shall be four or five theory papers in each subjects in each semester Practical examination of the subjects shall be conducted as per the syllabus framed and approved by the Board of Studies of that subject.
8. A student who has 60% or more aggregate marks in three semester can opt Dissertation as an Optional Paper in the forth semester if there is such a provision in the course of that subject.
9. In the theory papers of semester examination, there shall be 80 marks for external examination and 20 marks for internal examination. Each theory paper of the semester examination shall be of 80 marks in which there shall be ten questions in total out of which a candidate will have to attempt five questions Maximum marks of the practical decided by the board of studies of the subject.

EXAMINATION PATTERN :-

10. There shall be main examination at the end of the each semester First and Third semester examination shall be held as for a possible in the month of November and second & fourth semester examination shall be held as for as possible in the month of April.
11. To be successful in the exam a student has to score at least 20% marks in each Internal & External theory papers with an aggregate of 36% marks. Also to be successful in each practical paper a student has to score 36 marks. Best marks of the two internal text examination will be incorporated in the marks of semester examination. The head of the department shall submit the detailed mark list to the controller of Examination after the completion of all tests and seminars.
12. A student declared fail in one or two papers in the semester examination can appear in the second attempt examination in the same paper which will be held after two months of the main semester examination but if a student declared failed in more than two papers of semester examination will have to appear in all the four or five papers in the second attempt examination.
13. If a student is absent in all the papers of the main semester examination then she will be ineligible to appear in the second attempt examination, but if a student appears in some papers and fail to appear in the remaining papers of the main semester examination then she will have to submit an application giving reason to . the principal / Controller with sufficient

proofs. On the basis of proofs a High level committee will decide upon the matter. High level committee will have power to allow the student to appear in the second attempt examination.

14. A student who fails in a semester examination shall be eligible to take admission in the course of study of next semester but she shall not be eligible to appear in the next semester examination unless has passed all the remaining papers of the previous semester in the second attempt examination.
15. The admission of the student who fails in the second attempt examination of a semester, the admission to the next semester will automatically be cancelled and she will have to appear in all the papers of the semester examination in the next academic session as an Ex-student but marks of the internal examination will carry forward.
16. It is a must for the students to appear in the Internal test on the scheduled dates which will be declared by examination cell failing to which she shall be declared fail. If due to some unavoidable circumstances and sufficient reason the students fails to appear in the test on scheduled dates they have to appear before the High level Committee comprising of the Principal, Controller of Exam and Head of the Department of the particular subject with sufficient proof. The high level committee will decide the matter based on the proofs submitted by the students.
17. If a student leaves the college after taking admission in a course of study of semester without appearing in Internal & External examination and if she would like to take admission in any forthcoming academic session in the same semester she shall be given admission in the same session as a regular student but her status will be of Ex-student,
18. For Diploma courses there shall be annual examination pattern in which only external examination and practical examination will be held. There shall be no internal examination and seminars for these courses. Syllabus of these courses shall be framed by the board of studies, of the particular subject.
19. For B.Lib. I.Sc. course there shall be Annual Examination pattern and Internal tests & seminars will be organized.

Marks Scheme/Pattern of Question-

According to decision taken by the academic council of the college the pattern and marks scheme of question paper for P.G. as follows –

Type of Question	Q. to be set From each unit/Content	Q. to be solved	Marks Assigned	Total Marks
Objective / In few words	10	06	02	12
Short Answer Type Questions	07	04	05	20
Long/Essay type of question	07	04	12	48
			TOTAL	80

DIVISION AWARD

20. If a student is absent in all the papers of the main semester examination then she will be ineligible to appear in the second attempt examination, but if a student appears in some papers and fail to appear in the remaining papers of the main semester examination then she will have to submit an application giving reason to . the principal / Controller with sufficient proofs. On the basis of proofs a High level committee will decide upon the matter. High level committee will have power to allow the student to appear in the second attempt examination.
21. The division shall be awarded at the end of the Fourth Semester on the basis of taking together the aggregate of marks obtained by the students in all the four semester examination. The division shall be awarded on the following basis –
 1. I Division - 60% & above
 2. II Division - 48% & above but less than 60%
 3. III Division - 36% & above but less than 48%
22. A candidate who fails by one mark in a paer or in aggregate, shall be given grace mark but this one mark shall no where be added. Such candidate shall be declared pass with grace.
23. A candidate who lacks one mark to attain division shall be given one grace marks.
24. The names of first five candidates who have obtained first division at the end of the forth Semester will be declared in the order of merit.

REVALUATION :-

25. A candidate can apply for revaluation of answer books in not more than two theory papers: She has to pay prescribed fee for each paper within 15 days after the publication of the result of the semester examination. The provision of revaluation is only for the main exam and there is provision of revaluation for the second attempt examination.
26. The change in the marks will depend upon the rules of revaluation issued by the Bilaspur University, Bilaspur from time to time.
27. The points, which are not covered in the regulation mentioned above shall be governed by the existing rules, regulation and ordinance of Bilaspur University, Bilaspur (C.G.)

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M. Sc. Mathematics

First & Second Semester

SESSION : 2021-22

There shall be five papers. All papers are compulsory.

Paper	Title	Max. Marks		Min. Passing Marks	
		Ext.	Int.	Ext.	Int.
I	Advanced Abstract Algebra	80	20	29	07
II	Real Analysis	80	20	29	07
III	Topology	80	20	29	07
IV	Complex Analysis	80	20	29	07
V	Advanced Discrete	80	20	29	07

1.2.erk + 3. RA 4. Int 5. TBL 6. Int
27-8-21

2

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER I : ADVANCED ABSTRACT ALGEBRA-I

Session 2021-22

Maximum Marks: 80

.....

Normal series - Normal and subnormal series composition series Jordan Holder theorem, Solvable groups, Nilpotent groups. Rings and Ideals - Definitions, Maximal and prime ideals, Nilpotent and Nil ideals Zorn's Lemma (Statement Only) its application to obtain Maximal ideal.

Definition and examples sub modules quotient modules direct sums, Modules generated by a set, Homomorphism of modules, isomorphism theorems, Exact sequence of modules, Short exact sequence, Cyclic modules Simple modules, Semi-simple modules Schur's lemma, Free modules.

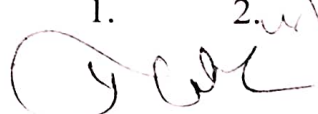

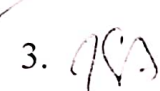
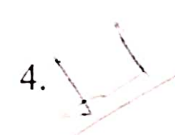
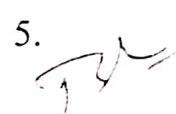

Field Theory - Extension fields, Algebraic and transcendental extensions, separable and inseparable extension, Normal extensions, Perfect fields, Finite Fields, Primitive Elements, Algebraically closed fields, Automorphism of extensions, Galois Extension, Fundamental theorem of Galois theory, Solution of Polynomial equations by radicals.

Text Book:

P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul Basic Abstract Algebra IInd Edition Cambridge University, Press Indian Edition.

Reference Books:

1. I.S. Herstein - Topics in Algebra Wiley Eastern Ltd. New Delhi (1975).
2. M. Artin Algebra Prentice Hall of India 1991.
3. D.S. Malik, J.N. Mordeson & M.K. Sen Fundamentals of Abstract Algebra, McGraw - Hill International Edition 1997.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER II - REAL ANALYSIS -I

Session 2021-22

Maximum Marks: 80

The Riemann -Stieltjes Integral: Definition and existence of Riemann- Stieltjes integral, Properties of the Integral, Integration and differentiation, the fundamental theorem of Calculus, integration of vector-valued function Rectifiable curves.

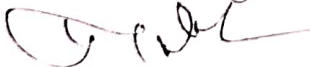



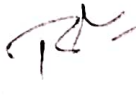

Functions of Several Variables : Linear transformation, Derivatives in an open subset of \mathbb{R}^n , Contraction principle, Inverse function theorem, Implicit function theorem, Derivatives of higher orders, Differentiation of integrals.

Sequences and series of Functions : Point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel's and Dirichlet's tests for uniform convergence, Uniform convergence and continuity uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation, Weierstrass approximation theorem .

Power Series :Uniqueness theorem for power series, Abel's and Tauber's theroem .

REFERENCES :

- [1] Walter Rudin:Principles of Mathematical Analysis' (3re edition) Mc Graw Hill, Kogakusha, 1976, International student edition.
- [2] P.K. Jain and V.P. Gupta: Lebesgue Measure and Integration, New age International (P) Limited published, New Delhi 1986 (Reprint 2000).

1.  2.  3.  4.  5.  6. 

4

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER III – TOPOLOGY -I

Session 2021-22

Max. Marks. 80

Definition and examples of topological spaces. Closed sets, Closure, Dense subsets Neighbourhoods, Interiors, exteriors and boundary points, Accumulation point and derived sets, Bases and sub-bases, subspaces and relative topology.

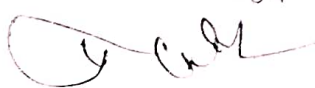

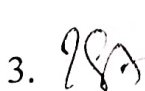

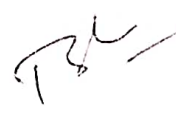

Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighbourhood systems.

Continuous functions and Homeomorphism .

First and second countable spaces, Lindelof's theorems, Seperable Spaces, Second Countability and Seperability, Separation axioms, T_0 , T_1 , T_2 , $T_{3/2}$, T_4 : their Characterization and basic properties. Uryshohn's lemma and Tietz Extension Theorem

REFERENCES::

1. G.F. Simmons :Introduction to Topology and Modern Analysis, Mc Graw -Hill
2. J.N .Sharma: Topology, Krishna Prakashan Mandir, Meerut
3. M.J.Mansfield: Introduction to Topology. Van Nostrand. Princeton, New Jersey, 1963
4. Jame R. Munkres: Topology, A First Course. Prentice Hall, Incorporated, 1974
5. K.D.Joshi: Introduction to General Topology , New Age International(P) Ltd. New Delhi.
6. J Dugundji. Topology. Boston: Allyn and Bacon, 1966. [OP]
7. B.Mendelson: Introduction to Topology, Dover Publications, 1990.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER IV : COMPLEX ANALYSIS- I

Session 2021-22

Max. Marks. 80

Complex Integration. Cauchy-Goursat Theorem. Cauchy's integral Formula. Higher order derivatives. Morera's theorem. Cauchy inequality and Liouville theorem. The fundamental theorem of Algebra. Taylor's theorem. Maximum modulus principle, Sewartz lemma. Laurent's series isolated singularities, Meromorphic functions.

The Argument principle. Rouche's theorem, Inverse function theorem.

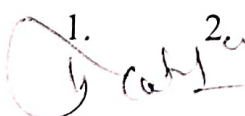
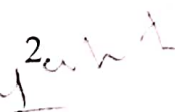
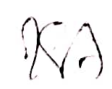



Residues, Cauchy's residue theorem. Evaluation of integrals. Branches of many values functions with special references to $\arg z$, $\log z$, and z^a .

Bilinear transformations their properties and classification. Definitions and examples of Conformal mappings.

Spaces of Analytical functions, Hurwitz's Theorem, Montel's theorem, Riemann mapping theorem

REFERENCES:-

1. J.B. Conway : Functions of one complex variable. Springer-Verlag international student Edition. Narosa. publishing House. 1980.
2. D. Sarason : Complex Function theory. Hindustan Book Agency. Delhi 1994.
3. S.Ponnusamy : Foundation of complex Analysis. Narosa publishing house 1997.
4. J.N. Sharma.: Functions of a complex variable, Krishna Prakashan Mandir, Meerut
5. B.S.Tyagi: Functions of a Complex Variable, Kedar Nath Ram Nath Prakashan, Meerut, 1981.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER V : ADVANCED DISCRETE MATHEMATICS - I

Session 2021-22

Max. Marks. 80

Formal logic : Statement and Notation, Connectives – Negation, Conjunction, Disjunction, Truth Table, Conditional and Biconditional, statement well formed formula, Tautology, Equivalent formula, Duality Law functionally complete set of connectives, two state devices and statement logic, Normal form, Principle conjunctives and Principle Disjunctive Normal forms, The theory of interface for the statement, calculus, Rules of Interface, Automatic Theorem proving, the predicate calculus, Quantifiers, Predicate formulas, Free and Bound variables, Interface theory of predicate calculus, valid formulas, over finite universe, valid formulas, involving quantifiers formulas involving more than one quantifiers.


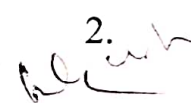
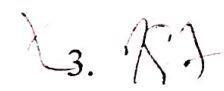
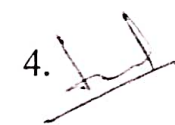


Algebraic Structure : Algebraic system, Semigroups and Monoids (including those pertaining to concatenation operation), Homomorphism of semigroups and monoids, Congruence relation and Quotient Semigroups, Sub semigroup and Sub Monoids. Direct products. Basic Homomorphism theorem.

Lattices : Lattices as partially ordered sets and their properties. Lattices as Algebraic systems, Sub lattices, Direct products, and homomorphism. Complete, Complemented and Distributive Lattice.

Boolean Algebra : Boolean Algebras as lattices. Various Boolean Identities. The switching Algebra example. Subalgebra, Direct products and Homomorphism. Join-irreducible elements. Atoms and minterms. Boolean forms and their Equivalence. Minterm Boolean forms. Sum of products canonical forms. Minimization of Boolean functions Application of Boolean Algebra Switching theory (Using AND, OR, NOT gates) The Karnaugh Map Method).

REFERENCES:

1. J.P. Tremblay & R. Manohar.: Discrete Mathematical structure with application to computer sciences. McGraw Hill Book Co. 1997.
2. Seymour Lipschutz.: Finite Mathematics (International edition 1993) McGraw Hill Book Co. New York.
3. N. Deo: Graph Theory with applications to Engineering and Computer Sciences. Prentice Hall of India.
4. S. Wiitala: Discrete Mathematics - A unified approach McGraw Hill Book Co. New York.
5. C.L. Liu: Elements of Discrete mathematics. McGraw Hill Book Co.
6. M.K.Gupta: Discrete Mathematics, Krishna Prakashan Mandir(P) Ltd., Meerut.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)
M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER I : ADVANCED ABSTRACT ALGEBRA - II

Session 2021-22

Maximum Marks: 80

Noetherian and Artinian Modules and rings, Hilbert's Basis theorem, Wedderburn Artin Theorem,

Smith Normal form over a PID and Rank.



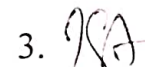



Fundamental structure theorem for finitely generated modules over a principal Ideal Domain and its applications to finitely generated abelian groups.

Text Books:

1. P.R. Bhattacharya, S.K. Jain and S.R. Nagapaul Basic Abstract Algebra IInd Edition cambridge University press Indian Edition 1997.
2. I.N. Herstein Topics in Algebra, Wiley Eastern Ltd. New Delhi 1975.

Reference Books:

1. M. Artin Algebra, Prentice Hall of India 1991.
2. D.S. Malik, J.N. Mordeson & M.K. Sen, Fundamentals of Abstract Algebra Mc-Graw Hill International Edition.

1.  2.  3.  4.  5.  6. 

2

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER II - REAL ANALYSIS -II

Session 2021-22

Max. Marks. 80

Measurable sets : Lebesgue outer measure, Lebesgue measure, Properties of measurable sets, Borel sets and their measurability characterization of measurable sets, Non measurable set.

Measurable functions : Definition and properties; Simple, Step and characteristics function, Continuous function, sets of measure Zero. Sequence of functions, Egoroff's theorem structure of measurable function, Lusin theorem, Frechet theorem, Convergence in measure, Riesz theorem.

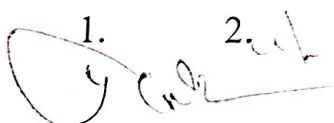

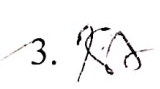



Lebesgue Integral : Lebesgue integral of a bounded function, Comparison of Riemann integral and Lebesgue integral, Bounded Convergence Theorem, Integral of non negative measurable functions, Fatou's lemma, Monotone convergence theorem, General Lebesgue integral, Lebesgue dominated convergence theorem.

Differentiation and integration : Dini derivatives, Differentiation of monotone functions, Lebesgue theorem, Function of bounded variation, Differentiation of an integral, Lebesgue sets, Absolutely Continuous Functions, Integral of the derivatives

Lebesgue L^p spaces : The classes L^p , Holder and Minikowski inequalities, L^p Banach Spaces, Convergences in the mean

REFERENCES :

- [1] Walter Rudin, 'Principles of Mathematical Analysis' (3rd edition) Mc Graw Hill, Kogakusha, 1976, International student edition.
- [2] P.K. Jain and V.P. Gupta: Lebesgue Measure and Integration, New age International (P) Limited published, New Delhi 1986 (Reprint 2000).

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER III – TOPOLOGY -II

Session 2021-22

Max. Marks. 80

Compactness continuous functions and compact sets, Basic properties of compactness, compactness and Finite Intersection Property, Sequentially and Countably compact sets, Local Compactness in Metric space Equivalence of compactness, countable compactness and sequential compactness in metric space.



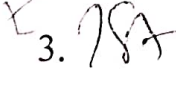
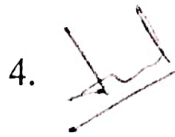
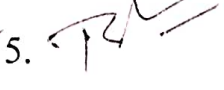

Connected spaces, connectedness on the real line, Components, Locally connected spaces.

Net and filters. Topology and convergence of Nets, Hausdorffness and nets, Filters and their convergence of nets.

Tychonoff product topology in terms of standard sub-base and its characterization. Projection Maps, Connectedness and product space. Compactness and Product space (Tychonoff's theorem)

REFERENCES:

1. G.F. Simmons :Introduction to Topology and Modern Analysis, Mc Graw -Hill
2. J.N .Sharma: Topology, Krishna Prakashan Mandir, Meerut
3. M.J.Mansfield: Introduction to Topology. Van Nostrand. Princeton, New Jersey, 1963
4. Jame R. Munkres: Topology, A First Course. Prentice Hall, Incorporated, 1974
5. K.D.Joshi: Introduction to General Topology , New Age International(P) Ltd. New Delhi.
6. J Dugundji. Topology. Boston: Allyn and Bacon, 1966. [OP]
7. B.Mendelson: Introduction to Topology, Dover Publications, 1990.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER IV : COMPLEX ANALYSIS- II

Session 2021-22

Max. Marks. 80

ENTIRE FUNCTIONS

Weierstrass factorization theorem Gamma function and its properties. Riemann Zeta function. Riemann's functional equation. Runge's theorem. Mittag Leffler's theorem. Analytic continuation uniqueness of direct analytic continuation. Uniqueness of analytic continuation along curve.

Power series method of analytic continuation. Schwartz's Reflection Principle. Monodromy theorem and it consequences. Harmonic functions on a disc , Harnack's Inequality and theorem , Dirichlet's Problem , Green's theorem .

Canonical products . Jensen's formula. Poisson - Jensen Formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence, Borel's theorem. Hadamard's factorization theorem.

The range of an analytic function. Bloch's theorem. The little Picard theorem.

Schottky's theorem. Montel Caratheodory and the Great Picard theorem.

Univalent functions. Bieberbach's conjecture (statement only) and the " 1/4 - theorem.

REFERENCES:-

1. J.B. Conway : Functions of one complex variable. Springer-Verlag international student Edition. Narosa. publishing House. 1980.
2. D. Sarason : Complex Function theory. Hindustan Book Agency. Delhi 1994.
3. S.Ponnusamy : Foundation of complex Analysis. Narosa publishing house 1997.
4. J.N. Sharma.: Functions of a complex variable , Krishna Prakashan Mandir, Meerut
5. B.S.Tyagi: Functions of a Complex Variable, Kedar Nath Ram Nath Prakashan, Meerut ,1981.

1. 2. 3. 4. 5. 6.

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER V : ADVANCED DISCRETE MATHEMATICS - II

Session 2021-22

Max. Marks. 80


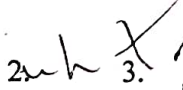

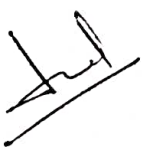


.....
Grammar and Language: Phase structure grammar, Rewriting Rules, Derivation, Sentential forms, context –sensitive context, Free and Regular grammars and languages, Notion of syntex, Analysis, Polish Notation, Conversion of Infix experience to Polish Notation. The Rename Polish Notation. Regular sets and regular expression

Introductory Computability Theory : Finite state Machines and their Transition, Table diagrams, Equivalence of Finite state Machines, reduced machines, Homomorphism Finite automata, and equivalence of its power to that of Deterministic finite automata.

Graph Theory : Definition of (undirected) graph, Paths, Circuits Cycles & Sub graphs, Induced Sub graphs, Degree of a vertex, Connectivity, Planar Graphs and their properties, Trees, Euler's Formula for connected planner Graphs. Complete and complete Bipartite graphs, Kuratowski's Theorem.(statement only), and it's use, Spanning trees. Cut sets. Fundamental Cut sets and cycles. Minimal spanning trees. Matrix representation of graphs, Euler's theorem on the Existence of Eulerian Paths, and circuit, Directed Graphs, In degree and out degree of a vertex. Weighted undirected Graphs.

REFERENCES:

1. J.P. Tremblay & R. Manohar.: Discrete Mathematical structure with application to computer sciences. McGraw Hill Book Co. 1997.
2. Seymour Lepschutz.: Finite Mathematics (International edition 1993) McGraw Hill Book Co. New York.
3. N. Deo: Graph Theory with applications to Engineering and Computer Sciences. Prentice Hall of India.
4. S. Wiitala: Discrete Mathematics - A unified approach McGraw Hill Book Co. New York.
5. C.L. Liu: Elements of Discrete mathematics. McGraw Hill Book Col.
6. M.K.Gupta: Discrete Mathematics , Krishna Prakashan Mandir(P) Ltd., Meerut.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. (AUTONOMOUS) COLLEGE

BILASPUR (C.G.)

M.Sc. Mathematics

(Third & Fourth Semester)

SESSION : 2021-22

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

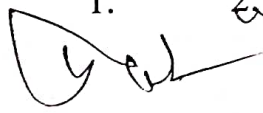
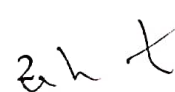
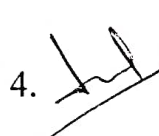


M. Sc. Mathematics

Third & Fourth Semester

SESSION : 2021-22

There shall be five papers. Two compulsory & three optional paper.

Paper	Title	Max. Marks		Min. Passing Marks	
		Ext.	Int.	Ext.	Int.
I	Functional Analysis	80	20	29	07
II	Mechanics	80	20	29	07
III (Optional)	Programming in C (With ANSI Features)	50	20	18	07
III (Practical)		30		11	
IV (Optional)	Information Theory Or Fuzzy Sets and their Application	80	20	29	07
V (Optional)	Operation Research	80	20	29	07

1.  2.  3. RA 4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

THIRD SEMESTER

M.Sc. [Mathematics]

PAPER - I (Compulsory): Integration Theory and Functional Analysis -I

Session 2021-22

Max. Marks. 80

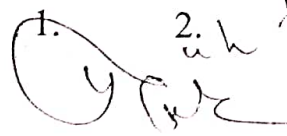
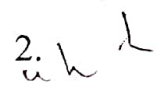


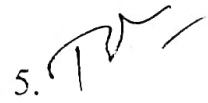

Signed measure. Hahn decomposition theorem, mutually singular measures. Radon-Nikodym theorem. Lebesgue decomposition. Riesz representation theorem. Extension theorem (Caratheodory).

Lebesgue-Stieltjes integral, product measures, Fubini's theorem. Tonnelle's theorem, Integral operator, Inner measure, Extension by set of measure zero, Caratheodory outer measure. Hausdorff measure., Differentiation and Integration. Decomposition into absolutely continuous and singular parts.

Baire sets. Baire measure, continuous functions with compact support. Regularity of measures on locally compact spaces.

REFERENCES:

- 1.H.L. Royden: Real Analysis, Macmillan Publishing Co. Inc., New York, 4th Edition, 1993.
- 2.B.Choudhary and Sudarsan Nanda: Functional Analysis with Applications Wiley EasternLtd., 1989
3. J.H. Williamson: Lebesgue Integration, Holt Rinehart and Winston, Inc. New York. 1962
- 4.P.R. Halmos: Measure Theory, Van Nostrand, Princeton, 1950.
5. T.G. Hawkins: Lebesgue's Theory of Integration: Its Origins and Development, Chelsea, New York, 1979.
6. B.V.Limaye: Functional Analysis, Wiley Eastern Ltd.
7. G.de. Barra: Measure, Theory & Integration, Wiley Eastern Ltd, 1981.
8. Walter Rudin: Real & Complex Analysis, Tata McGraw Hill Publishing. Company, New Delhi.
9. P.K.Jain , O.P.Ahuja & Khalid Ahmad: Functional Analysis, New Age International (P)Ltd., New Delhi.
- 10.A.Siddiqui: Functional Analysis with Applications: Tata McGraw Hill Publishing Company, New Delhi.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

THIRD SEMESTER

M.Sc. [MATHEMATICS]

PAPER – II(Compulsory) : Partial Differential Equations, Mechanics & Gravitation - I

Session 2021-22

Max. Marks. 80

Partial Differential Equations

Laplace's Equation- Fundamental solution, Mean value formulae, Properties of Harmonic function, Green function, Energy method

Heat Equation: Fundamental solution, Mean value formulae, Properties of solution, Energy method .

Wave Equation: Solutions by spherical means, Homogeneous equations, Energy method.

Non-linear first order PDE, complete integrals, Envelopes characteristics, Hamilton Jacobi equations (calculus of variations, Hamiltons ODE), Conservation Laws, Representation of solutions, Separation of variables.

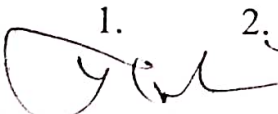
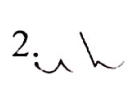
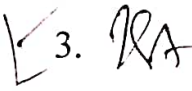
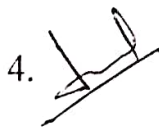


Laplace and Fourier Transforms and their applications, Legendre Transform.

Attraction: Attraction of rod, disc, spherical shell and sphere,

Surface integral of normal attraction .

REFERENCES :

- 1.D.Raisinghania :Ordinary and Partial Differential Equation, S.Chand , New Delhi.
- 2.Gupta ,Kumar & Sharma: Classical - Mechanics, Pragati Prakashan,
- 3.S.L. Loney :An Elementary Treatise On Statics,University Press.
- 4.I.N. Sneddon: Partial Differential Equation , Mc Graw Hill Book Co.Ltd.
- 5.H.Goldstem: Classical Mechanics, Addition Wesley.
- 6.Narayan Chandra Rana & Pramod Sharad, Chandra Joag: Classical Mechanics. Tata McGraw-Hill Publishing Company, 1991.
- 7.B.D. Gupta & Satya Prakash: Mechanics Relativity .Pragati Prakshan, Meerut.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

M.Sc. [Mathematics]
THIRD SEMESTER

PAPER III(Optional) : Programming in C (with ANSI features) –I
Session 2021-22

Max. Marks. 80

[THEORY 50+PRACTICAL 30]

.....

An overview of programming. Programming language, Classification.
C-Essentials Program Development. Functions. Anatomy of a C Function. Variables and Constants.
Expressions. Assignment Statements. Formatting Source Files. Continuation Character. The Preprocessor.
Scalar Data Types-Declarations, Different Types of Integers, Different kinds of Integer Constants. Floating-Point Types. Initialization. Mixing Types, Explicit Conversions-Casts. Enumeration Types, The Void Data Type, Typedefs, Finding the Address of an object. Pointers.
Control Flow-Conditional Branching. The Switch Statement. Looping. Nested Loops. The break and continue Statements. The goto statement. Infinite Loops.

REFERENCES:

1. Peter A. Darnell and Philip E. Margolis, C: A Software Engineering Approach, Narosa Publishing House (Springer International Student Edition) 1993.
2. Brian W. Kernighan & Dennis M. Ritchie: The C Programme Language, 2nd Edition (ANSI Features), Prentice Hall 1989.
3. Yashwant Kanetkar: Let Us C, 8th Edition, B P B Publications 2007.
4. E. Balagurusamy: Programming in C (ANSI), 4th Edition, Tata Mac Graw Hill.

1. Dal 2. uh 3. RA 4. ~~LD~~ 5. T 6. A

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

THIRD SEMESTER

M.Sc. [Mathematics]

PAPER – IV(Optional) : Fuzzy Sets and their Applications –I

Session 2021-22

Max. Marks. 80

Fuzzy sets: Basic definitions α - cuts, Convex fuzzy sets, Basic operations on fuzzy sets, Types of fuzzy sets, properties of α -cuts, representation of fuzzy sets, First and Second decomposition theorem, Extension Principle for fuzzy sets, fuzzy complements, the two characterization theorems on fuzzy Complements, t-norms and t-conorms. Algebraic product and sum, bounded difference and sum, statements of characterization theorem for t-norms and t-conorms, combination of operators.

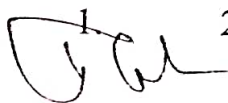
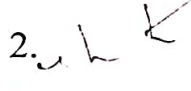


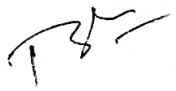

Fuzzy Arithmetic: Fuzzy numbers, Arithmetic operations on fuzzy numbers, Lattices of fuzzy numbers, fuzzy equations.

Fuzzy Relations : Fuzzy relations on fuzzy sets, fuzzy binary relations and fuzzy equivalence relations. Fuzzy morphism, standard composition, \sup_i composition, \inf_{-w_i} composition of fuzzy relations.

Fuzzy Relations Equations : Problem partitioning, solution methods, fuzzy relation equations based upon \sup_i composition and \inf_{-w_i} composition, approximate solution.

REFERENCES:

1. G.J. Klir and B. Yuan : Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi
2. H.J. Zimmermann : Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)
THIRD SEMESTER

M.Sc. [Mathematics]

PAPER IV(Optional) : INFORMATION THEORY - I

Session 2021-22

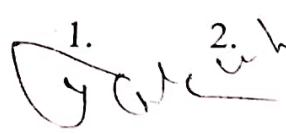
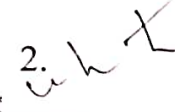


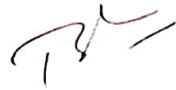

Max. Marks. 80

Measure of Information- Axioms for a measure of uncertainty. The Shannon entropy and its properties. Joint and conditional entropies. Transformation and its properties. Some Intuitive properties of a measure of entropy - Symmetry, normalization, expansibility, boundedness, recursivity, maximality, stability, additivity, subadditivity, nonnegativity, continuity, branching etc. and interconnections among them. Axiomatic characterization of the Shannon entropy due to Shannon and Fadeev. Axiomatic characterization of the Shannon entropy due to Tverberg and Leo.

Information functions, the fundamental equation of Information, information function continuous at the origin, nonnegative bounded information functions, measurable information functions and entropy. The fundamental theorem of Information Theory and its strong and weak converses.

REFERENCES:

1.R.ASH: Information Theory , Inter science Publishers, New York, 1965.
 2.F.M.REZA: An Introduction to Information Theory, McGraw Hill Book Company, Inc.,1961
 3.J,Acel and Z.Daroczy: On Measures of Information and their characterization, Academic Press, New York

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

THIRD SEMESTER

M.Sc. [Mathematics]

PAPER V(Optional) : Operations Research –I

Session 2021-22

Max. Marks. 80

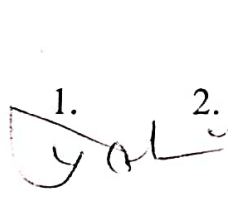
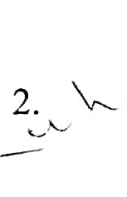
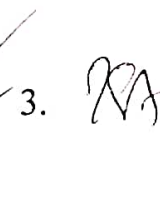
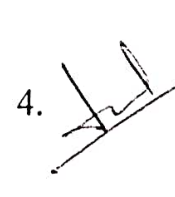
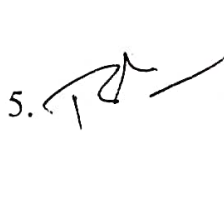

Operations Research and its Scope. Necessity of Operations Research in Industry. Linear Programming-graphical method of solutions, Simplex Method. Theory of the Simplex Method. Two phase method, Big M method of solution to an LPP. Duality in linear programming, Duality theorems, Dual Simplex method. Other Algorithms for Linear Programming-Dual Simplex Method.

Parametric Linear Programming. Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming. Assignment Problems, It's mathematical formulation, Solution of assignment problems, Optimality test. Transportation problems, Formulation of transportation problems, Solutions of Transportation problems, North-West corner method, Least cost method, Vogel's approximation method, Test for optimality U-V method.

Network Analysis-Shortest Path Problem. Minimum Spanning Tree Problem. Maximum Flow I Problem. Minimum Cost Flow Problem. Network Simplex Method. Project Planning and Control I with PERT CPM.

REFERENCES :

1. F.S. Hillier and G.J. Ueberman: Introduction to Operations ResBareft (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995 Affiliated East-West Press Pvt. Ltd., New Delhi, Madras.
2. G. Hadley: Linear Programming, Narosa Publishing House, 1995.
3. G. Hadly, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.
4. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali: Linear Programming and Network flows, John Wiley I * & Sons, New York, 1990.
5. H.A. Taha: Operations Researc~An introduction, Macmillan Publishing Co., Inc., New York.
6. K. Swarup, P.K. Gupta and M. Mohan: Operations Research, Sultan Chand & Sons, N.Delhi.
7. S.S. Rao: Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
8. P. K.. Gupla and D.S. Hira, : Operations Research ,S. Chand & Co. Ltd., N.Delhi.
9. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi, Madras.
10. S.D.Sharma: Operations Research, Kedar Nath Ram Nath Publication, Meerut.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

FOURTH SEMESTER

M.Sc. [Mathematics]

PAPER I (Compulsory) : Integration Theory and Functional Analysis - II

Session 2021-22

Max. Marks. 80

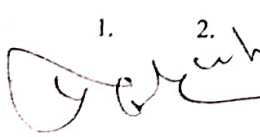
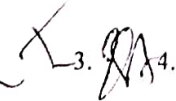




Normed linear spaces. Banach spaces and examples. Quotient space of normed linear spaces and its completeness, equivalent norms. Riesz Lemma, basic properties of finite dimensional normed linear spaces and compactness. Weak convergence and bounded linear transformations, normed linear spaces of bounded linear transformations, dual spaces with examples .

Uniform boundedness theorem and some of its consequences. Open mapping and closed graph theorems. Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces. Reflexive spaces. Weak Sequential Compactness. Compact Operators. Solvability of linear equations in Banach spaces (Fredholm alternatives). The closed Range Theorem.

Inner product spaces. Hilbert spaces. Orthonormal Sets. Bessel's inequality. Complete orthonormal sets and Parseval's identity. Structure of Hilbert spaces. Projection theorem. Riesz representation theorem. Adjoint of an operator on a Hilbert space. Reflexivity of Hilbert spaces. Self-adjoint operators, Positive, projection, normal and unitary operators.

REFERENCES:

- 1.H.L. Royden: Real Analysis, Macmillan Publishing Co. Inc., New York, 4th Edition, 1993.
- 2.B.Choudhary and Sudarsan Nanda: Functional Analysis with Applications Wiley EasternLtd., 1989
3. J.H. Williamson: Lebesgue Integration, Holt Rinehart and Winston, Inc. New York. 1962
4. P.R. Halmos: Measure Theory, Van Nostrand, Princeton, 1950.
5. T.G. Hawkins: Lebesgue's Theory of Integration: Its Origins and Development, Chelsea, New York, 1979.
6. B.V.Limaye: Functional Analysis, Wiley Eastern Ltd.
7. G.de. Barra: Measure Theory & Integration, Wiley Eastern Ltd, 1981.
8. Walter Rudin: Real & Complex Analysis, Tata McGraw Hill Publishing. Company, New Delhi.
9. P.K.Jain , O.P.Ahuja & Khalid Ahmad: Functional Analysis, New Age International (P)Ltd., New Delhi.
- 10.A.Siddiqui: Functional Analysis with Applications: Tata McGraw Hill Publishing Company, New Delhi.

1.  2.  3.  4.  5.  6.   

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

FOURTH SEMESTER

M.Sc. [MATHEMATICS]

PAPER – II (Compulsory): Partial Differential Equations, Mechanics & Gravitation - II

Session 2021-22

Max. Marks. 80

Analytical Dynamics

Generalised Co-ordinates, Holonomic and Non-holonomic Systems. Scleronomic and Rheonomic System, Generalised Potentials.

Lagrange's equations of first kind, Lagrange's equations of second kind. Uniqueness of solution, Energy equation for conservation fields.

Hamilton's variables.. Hamilton canonical equations. Cyclic coordinates. Routh's equations.

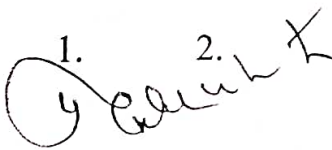
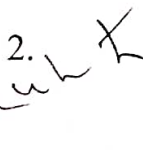

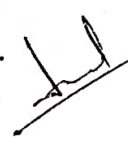
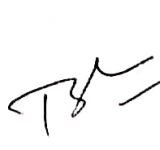

Poisson's Bracket. Poisson's Identity. Jacobi-Poisson Theorem. Motivating problems of calculus of variations, Shortest distance. Minimum surface of revolution. Brachistochrone problem. Isoperimetric problem. Geodesic, Lagrange's bracket and its properties, Fundamental lemma of calculus of variations. Euler's equation for one dependent function and its generalization to (i) independent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

Gravitation

Potential of rod, disc, spherical shell and sphere, spherical shell of finite thickness. Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics. Surface density in terms of surface harmonics. Gauss's theorem, Laplace and Poisson equations, work done by self attracting system.

REFERENCES :

1. D. Raisinghania : Ordinary and Partial Differential Equation, S.Chand, New Delhi.
2. Gupta, Kumar & Sharma: Classical - Mechanics, Pragati Prakashan,
3. S.L. Loney : An Elementary Treatise On Statics, University Press.
4. I.N. Sneddon: Partial Differential Equation, Mc Graw Hill Book Co.Ltd.
5. H. Goldstem: Classical Mechanics, Addison Wesley.
6. Narayan Chandra Rana & Pramod Sharad, Chandra Joag: Classical Mechanics. Tata McGraw-Hill Publishing Company, 1991.
7. B.D. Gupta & Satya Prakash: Mechanics Relativity .Pragati Prakashan, Meerut.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

**M.Sc. [Mathematics]
FOURTH SEMESTER**

PAPER III (Optional) : Programming in C (with ANSI features) –II

Session 2021-22

Max. Marks. 80

[THEORY 50+PRACTICAL 30]

Operators and Expressions-Precedence and Associativity. Unary Plus and Minus operators. Binary Arithmetic Operators. Arithmetic Assignment Operators. Increment and Decrement Operators. Comma Operator. Relational Operators. Logical Operators. Bit - Manipulation Operators. Bitwise Assignment Operators. Cast Operator. Size of Operators. Conditional Operator. Memory Operators.

Arrays - Declaring an Array. Array and Memory. Initializing Arrays. Encryption and Decryption..

Storage Classes-Fixed vs. Automatic Duration. Scope. Global variables. The Register Specifier. ANSI rules for the syntax and Semantics of the storage – class keywords.

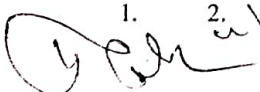





Pointers - Pointer Arithmetic. Passing Pointers as Function Arguments. Accessing Array Elements through Pointers. Passing Arrays as Function Arguments. Sorting Algorithms. Strings. Multidimensional Arrays. Arrays of Pointers. Pointers to Pointers.

Functions-Passing Arguments. Declarations and Calls. Pointers to Functions. Recursion. The main Function. Complex Declarations. The C Preprocessor-Macro Substitution. Conditional Compilation. Include Facility. Line Control.

Structures and Unions-Structures. Dynamic Memory Allocation. Linked Lists. Unions, enum Declarations.

REFERENCES:

1. Peter A. Darnell and Philip E. Margolis, C: A Software Engineering Approach, Narosa Publishing House (Springer International Student Edition) 1993.
2. Brian W. Kernighan & Dennis M. Ritchie: The C Programme Language, 2nd Edition (ANSI Features), Prentice Hall 1989.
3. Yashwant Kanetkar: Let Us C, 8th Edition, B P B Publications 2007.
4. E. Balagurusamy: Programming in C (ANSI), 4th Edition, Tata Mac Graw Hill.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

FOURTH SEMESTER
M.Sc. [Mathematics]

PAPER IV(Optional) : Fuzzy Sets and their Applications –II

Session 2021-22

Max. Marks. 80

Possibility Theory :Fuzzy measures, evidence theory, possibility theory, necessity measure, fuzzy sets and possibility theory, possibility theory versus probability theory.

Fuzzy logic : An overview of classical logic. Multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic Hedges, Inference from conditional and qualified fuzzy proposition, the compositional rule of inference.

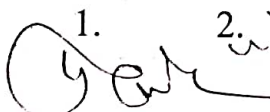
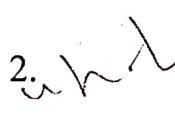
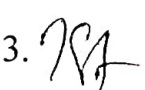



Approximate reasoning : An overview of fuzzy expert systems, Fuzzy implications and their selection, Multi conditional approximate reasoning, the role of fuzzy relation equations.

An introduction to fuzzy control : Fuzzy controllers, Fuzzy rule base. Fuzzy inference engine, Fuzzification. Defuzzification and various defuzzification methods (the center of area, the center of maxima, and the mean of maxima methods.)

Decision Making in Fuzzy Environment-Individual decision making . Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods . Fuzzy linear programming.

REFERENCES:

1. G.J. Klir and B. Yuan : Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi
2. H.J. Zimmermann : Fuzzy Sets and Fuzzy logic, Prentice Hall of India New Delhi.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)
FOURTH SEMESTER

M.Sc. [Mathematics]

PAPER -IV (Optional) : INFORMATION THEORY - II
Session 2021-22

Max. Marks.80

Information Functions: The general solution of the fundamental equation of information. Derivations and their role in the study of information functions.

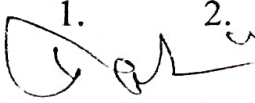
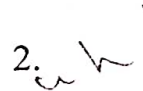


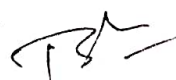

Continuous Channels: The time -discrete Gaussian channel. Uncertainty of an absolutely continuous random variable. The converse to the coding theorem for time-discrete Gaussian channel. The time -discrete Gaussian channel, Band-limited channels.

Noisless Coding- Ingredients of noiseless coding problem. Uniquely decipherable codes. Necessary and Sufficient condition for the existence of instantaneous codes. Construction of optimal codes.

Discrete Memoryless Channel ; Classification of channels. Information processed by a channel. Calculation of channel capacity. Decoding schemes. The ideal observer.

REFERENCES:

1. R.ASH: Information Theory , Inter science Publishers, New York, 1965.
2. F.M.REJA: An Introduction to Information Theory, McGraw Hill Book Company, Inc., 1961
3. J, Aczel and Z. Daroczy: On Measures of Information and their characterization, Academic Press, New York.

1.  2.  3.  4.  5.  6. 

GOVT. BILASA GIRLS' P. G. COLLEGE, BILASPUR (C.G.)

FOURTH SEMESTER

M.Sc. [Mathematics]

PAPER - V(Optional) : Operation Research –II

Session 2021-22

Max. Marks. 80

Dynamic Programming-Deterministic and Probabilistic Dynamic programming.

Game Theory-Two-Person, Zero-Sum Games. Games with Mixed Strategies. Graphical Solution. Solution by Linear Programming.


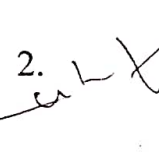
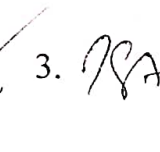
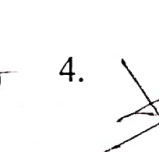
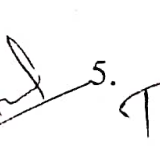
Integer Programming

Queueing system: Deterministic Queueing system, probability distribution in Queueing, classification of Queueing models, Poission Queueing system ((M/M/I): (∞ /FIFO), (M/M/I): (/SIRO) (M/M/I): (N/FIFO)), Inventory control : The concept of EOQ, Deterministic inventory problem with no shortages.

Nonlinear Programming- One and Multi-Variable Unconstrained Optimization. Kuhn-Tucker Conditions for Constrained Optimization. Quadratic Programming. Separable Programming. Convex Programming. Non-convex Programming.

.....
REFERENCES :

1. F.S. Hillier and G.J. Ueberman: Introduction to Operations ResBareft (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995 Affiliated East-West Press Pvt. Ltd., New Delhi, Madras.
2. G. Hadley: Linear Programming, Narosa Publishing House, 1995.
3. G. Hadly, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.
4. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Serali: Linear Programming and Network flows, John Wiley I ' & Sons, New York, 1990.
5. H.A. Taha: Operations Researc~-An introduction, Macmillan Publishing Co., Inc., New York.
6. K. Swarup, P.K. Gupta and M. Mohan: Operations Research, Sultan Chand & Sons, N.Delhi.
7. S.S. Rao: Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
8. P. K.. Gupla and D.S. Hira, : Operations Research ,S. Chand & Co. Ltd., N.Delhi.
9. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi, Madras.
10. S.D.Sharma: Operations Research,Kedar Nath Ram Nath Publication, Meerut.

1.  2.  3.  4.  5.  6. 