

बस्तर विश्वविद्यालय  
जगदलपुर (धरमपुरा), जिला-बस्तर (छत्तीसगढ़)



पाठ्यक्रम

M.A./M.Sc. Final  
Mathematics, Anthropology

परीक्षा : 2011.

कुलसचिव  
बस्तर विश्वविद्यालय, जगदलपुर  
छत्तीसगढ़ की ओर से



अधिकृत मुद्रक एवं प्रकाशक :

**गीता पब्लिकेशन**

महामाईपारा, रायपुर (छत्तीसगढ़)

REVISED ORDINANCE NO. - 22  
MASTER OF SCIENCE EXAMINATION

INDEX

1. The examination for the degree of Master of Science shall consist of two parts-
  - a) The Previous Examination; and
  - b) The Final Examination.
2. A candidate who after obtaining the degree of Bachelor of Science of the University or an examination of any Statutory University in India which has been recognised by the University as equivalent to the B.Sc. degree of the University and has completed a regular course of study for one academic year in a teaching department of the University or in a college affiliated to the University, shall be admitted to the Previous Examination for the degree of Master of Science. A candidate after passing a graduate Examination under 11+3 Scheme or any other examination recognised by the University as equivalent thereto shall be eligible for admission to a post graduate course of studies where graduation is minimum qualification only after passing One Year Bridge Course prescribed for the purpose. This shall apply to student graduating in 1991 examination.  
Provided, however, every candidate shall offer for the Previous examination one of the subjects offered by him/her B.Sc. degree. However, a candidate passing B.Sc. with any of the subject prescribed for the examination, will be eligible to offer Anthropology as one of the subjects at the Previous Examination.  
Provided further (i) for admission in M.Sc. Previous (Physics) a candidate must have offered Maths as one of the subjects in B.Sc., (ii) for admission in M.Sc. Previous (Chemistry) preference will be given to those who have offered Maths as one of their subjects in B.Sc.
3. A candidate who, after passing the M.Sc. Previous Examination of the University, has completed a regular course of study for one academic year in a teaching department of the University or in a college affiliated to the University shall be admitted to the Final Examination for the degree of Master of Science in the subjects in which he/she has passed the Previous Examination.  
A candidate who has passed the Previous Examination for the degree of Master of Science of another University, may also be admitted to the Final Examination for the degree of Master of Science obtaining previous permission of the Kulpati, provided he offered for his Previous Examination a course of study of an equivalent standard with almost identical syllabus as is required for the Previous Examination of this University and has attended a regular course of study for one academic year in a teaching department of the University or in a college affiliated to the University.
4. The Examination shall be partly by means of papers and partly practical including sessionals, except in the case of Mathematics where the Examination shall be by means of papers only.
5. Besides regular students and subject to their compliance with this Ordinance, ex-students and non-collegiate candidate shall be eligible for admission to the Examination as per provision of Ordinance No. 6 relating to Examination (General).

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1. Ordinance No.	
2. Mathematics	
3. Anthropology	



A candidate securing 60% or more marks in the M.Sc. Previous Examination will be eligible to offer "dissertation" in lieu of one of optional papers for the Final. A regular candidate can offer dissertation with the permission of the Professor and Head of Department of his institution, while a private candidate will have to secure the prior permission in writing of any of the professors of the subject working in an institution within the jurisdiction of the University and will work under supervision of that professor after obtaining prior permission of the University to that effect.

Provided that non-collegiate candidates shall be permitted to offer only such subject/papers as are taught to the regular students at any of the University teaching department or college.

6. The subject of Examination shall be one of the following :

- (i) Mathematics
- (ii) Anthropology

Any candidate who has passed the M.Sc. Examination of this University in any subject shall be allowed to present himself in Examination in any one or more of the optional papers in the subject not taken by him at the said Examination and if successful, will be given a certificate to that effect.

Provided that no candidate shall be allowed to offer more than two additional papers in any one year and in subjects other than Mathematics, a candidate shall undergo a practical test in respect of the paper concerned.

7. For both the Previous and Final Examinations a candidate will be declared successful if he/she obtains atleast 36% of the aggregate marks in the subject. A candidate is required to pass in the Practical Examination separately by obtaining not less than 36% marks.

8. The division in which a candidate is placed shall be determined on the basis of aggregate marks obtained in the total of the M.Sc. Previous and M.Sc. Final Examinations. No division will be assigned on the Previous Examination.

9. Successful candidates who obtain 60% or more of the aggregate marks shall be placed in the First Division; those obtaining less than 60% but not less than 48% in the Second Division; and all other successful candidates obtaining less than 48% in the Third Division.

10. Candidates who have passed in the M.Sc. Examination of the University in any subject in Third or Second Division and desire to appear at the M.Sc. Examination in the same Subject for improving Division may without attending a regular course of study in a college affiliated to the University or in a Teaching Department of the University shall be allowed to appear at the aforesaid Examination as non-collegiate students on the following conditions :

- (i) There shall be only two Divisions for such candidates i.e. First Division and Second Division. The marks required for obtaining these divisions shall be the same as prescribed in the Ordinance i.e. examinees who are successful in Final of the Examination and have obtained 60% or more of the aggregate in total of the marks in the Previous and Final of the Examination taken together shall be placed in the

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First Division and examinees who are successful in Final of the Examination and have obtained less than 60% but not less than 48% marks in the Previous and Final of the Examination taken together shall be placed in the Second Division.

(ii) The results of the candidates obtaining less than 48% of the aggregate marks in the Previous and Final of the Examination taken together shall not be declared.

(iii) Candidates shall have the option to appear at both the Previous and Final Examination in one and the same year and for being successful at the Examination, the candidate shall obtain 48% of the aggregate marks.

Provided that such candidates who opt to appear in Previous and Final Examinations separately shall have to obtain minimum aggregate required for the Previous Examination but he will have to obtain atleast 48% in the aggregate of the Previous and Final Examination taken together or else his result will be cancelled.

(iv) The syllabus for the Examination shall be same as prescribed for the year in which examination is held.

(v) Not more than two attempts shall be allowed to such candidates, failure or non-appearance at the Examination after permission has been accorded by the University shall be counted as an attempt.

Provided, however, such candidates who opt to appear at the Previous and Final Examinations separately will be allowed only one attempt at the Previous Examination and two attempts at the Final Examination.

(vi) Candidates who wish to avail the opportunity given in the foregoing paras will have to apply for the permission as required in the Ordinance relating to admission of Non collegiate Students to the University Examination along with requisite Registration Fee.

(vii) In case a student improves his division under the provisions of this para, the fresh degree will be issued after cancelling his first degree.

### USE OF CALCULATORS

The students of Degree/P.G. classes will be permitted to use of Calculator in the examination-hall from annual 1986 examination on the following conditions as per decision of the standing Committee of the Academic Council.

1. Student will bring their own Calculators.

2. Calculators with memory and following variables be permitted : +, -, x, ÷, square, reciprocal, exponential log, square root, trigonometric functions viz sine, cosine, tangent ect. factorial summation, xy, yx and in the light of objective approval of merits and demerits of the viva only will be allowed.

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**MATHEMATICS**

There shall be five papers. Two compulsory and three optional. Each paper shall have 100 marks. Out of these five papers, the paper which has theory and practical both, the theory part shall have 70 marks and practical part shall have 30 marks.

Paper	Description	Theory	Practical	Remark
<b>Compulsory Papers</b>				
I	Integration Theory & Functional Analysis	100	-	-
II	Partial Differential Equations & Mechanics	100	-	-
<b>Compulsory Papers</b>				
III	(i) Graph Theory	100	-	-
	(ii) Programming in C (with ANSI Features)	70	30	For regular students only
IV	(i) Operations Research	100	-	-
	(ii) Wavelets	100	-	-
V	(i) General Relativity and Cosmology	100	-	-
	(ii) Fundamentals of Computer Science	70	30	For regular students only
	(iii) Fuzzy Sets and their applications	100	-	-

**COMPULSORY PAPER - I**

**INTEGRATION THEORY AND FUNCTIONAL ANALYSIS**

M.M. : 100

**INTEGRATION THEORY:**

**UNIT-I** 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. Differentiation and Integration. Decomposition into absolutely continuous and singular parts.

**UNIT-II** Baire sets. Baire measure, continuous functions with compact support. Regularity of measures on locally compact spaces: Integration of continuous functions with compact support, Riesz-Markoff theorem.

**FUNCTIONAL ANALYSIS :**

**UNIT-III** Normed linear spaces. Banach spaces and examples. Quotient space of normed linear

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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.

**UNIT-IV** 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. The closed Range Theorem.

**UNIT-V** 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. Abstract variational boundary-value problem. The generalized Lax-Milgram theorem.

**BOOK RECOMMENDED :**

1. P.R. Halmos, Measure Theory, Van Nostrand, Princeton, 1950.
2. B. Choudhary and Sudarsan Nanda, Functional Analysis with Applications, Wiley Eastern Ltd., 1989.
3. H.L. Royden, Real Analysis, Macmillan Publishing Co. Inc., New York, 4th Edition, 1993.

**REFERENCES :**

1. S.K.Berberian, Measure and integration, Chelsea Pub. Company, New York, 1965
2. G. de Barra, Measure Theory and Integration, Wiley Eastern Limited, 1981.
3. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age International (P) Limited, New Delhi, 2000.
4. Richard L. Wheeden and Antoni Zygmund, Measure and Integral : An Introduction to Real Analysis, Marcel Dekker Inc. 1977.
5. J.H. Williamson, Lebesgue Integration, Holt Rinehart and Winston, Inc. New York. 1962.
6. T.G. Hawkins, Lebesgue's Theory of Integration: Its Origins and Development, Chelsea, New York, 1979.
7. K.R. Parthasarathy, Introduction to Probability and Measure, Macmillan Company of India Ltd., Delhi, 1977.
8. R.G. Bartle, The Elements of Integration, John Wiley & Sons, Inc. New York, 1966.
9. Serge Lang, Analysis I & II, Addison-Wesley Publishing Company, Inc. 1967.
10. Inder K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, Delhi, 1997.
11. Walter Rudin, Real & Complex Analysis, Tata McGraw-Hill Publishing.
12. Edwin Hewitt and Karl Stromberg, Real and Abstract Analysis, Springer-Verlag, New York.
13. Edwin Hewitt and Kenneth A. Ross, Abstract Harmonic Analysis, Vol. 1, Springer-Verlag, 1993.
14. G. Bachman and L. Narici, Functional Analysis, Academic Press, 1966.
15. N.Dunford and J.T. Schwartz, Linear Operators, Part I, Interscience, New York, 1958.
16. R.E. Edwards, Functional Analysis, Holt Rinehart and Winston, New York, 1965.
17. C. Goffman and G. Pedrick, First Course in Functional Analysis, Prentice Hall of India, New Delhi, 1987.
18. P.K. Jain, O.P. Ahuja and Khalil Ahmad, Functional Analysis, New Age International (P)



Functions, Cauchy-Kovalevskaya Theorem).

## MECHANICS

### ANALYTICAL DYNAMICS:

**UNIT-III** Generalized coordinates. Holonomic and Non-holonomic systems. Scleronomic and Rheonomic systems. Generalized potential. Lagrange's equations of first kind. Lagrange's equations of second kind. Uniqueness of solution. Energy equation for conservative fields.

Hamilton's variables. Donkin's theorem. 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. Fundamental lemma of calculus of variations. Euler's equation for one dependent function and its generalization to (1) 'n' dependent functions, (ii) higher order derivatives. Conditional extremum under geometric constraints and under integral constraints.

**UNIT-IV** Hamilton's Principle. Principle of least action. Poincare Cartan Integral invariant. Whittaker's equations. Jacobi's equations. of Lee Hwa Chung's theorem. Statement of Lee Hwa Chung's theorem.

Canonical transformations and properties of generating functions. Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables. Lagrange Brackets. Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, invariance of Lagrange brackets and Poisson brackets under canonical transformations.

### GRAVITATION:

**UNIT-V** Attraction and potential of rod, disc, spherical shells and sphere. Surface integral of normal attraction (application & Gauss' theorem). Laplace and Poisson equations. Work done by selfattracting systems. Distributions for a given potential. Equipotential surfaces. Surface and solid harmonics. Surface density in terms of surface harmonics.

### BOOK RECOMMENDED :

1. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Volume 19, AMS, 1998.
2. F. Gantmacher, Lectures in Analytic Mechanics, MIR Publishers, Moscow, 1975.
3. C.R.Mondal, Classical Mechanics, Prentice Hall of India
4. S.L. Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi, 1979.

### REFERENCES :

1. A.S. Ramsey, Dynamics Part II, The English Language Book Society and Cambridge University Press, 1972.
2. H. Goldstein, Classical Mechanics (2<sup>nd</sup> edition), Narosa Publishing House, New Delhi.
3. I.M. Gelfand and S.V. Fomin, Calculus of Variations, Prentice Hall.
4. A.S. Ramsey, Newtonian Gravitation, The English Language Book Society and the Cambridge University Press.
5. Narayan Chandra Rana & Pramod Sharad Chandra Joag, Classical Mechanics, Tata McGraw Hill, 1991.
6. Louis N. Hand and Janet D. Finch, Analytical Mechanics, Cambridge University Press, 1998.

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Ltd. & Wiley Eastern Ltd., New Delhi, 1997.

19. R.B. Holmes, Geometric Functional Analysis and its Applications, Springer-Verlag, 1975.
20. K.K. Jha, Functional Analysis, Students' Friends, 1986.
21. L.V. Kantorovich and G.P. Akilov, Functional Analysis, Pergamon Press, 1982.
22. E. Kreyszig, Introductory Functional Analysis with Applications, John Wiley & Sons, New York, 1978.
23. B.K.Lahiri, Elements of Functional Analysis. The World Press Pvt.Ltd., Calcutta, 1994.
24. B.V. Limaye, Functional Analysis, Wiley Eastern Ltd.
25. L.A. Lusternik and V.J. Sobolev, Elements of Functional Analysis, Hindustan Publishing Corporation, New Delhi, 1971.
26. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company, New York, 1963.
27. A.E. Taylor, Introduction to Functional Analysis, John Wiley and Sons, New York, 1958.
28. K.Yosida, Functional Analysis, 3rd edition Springer-Verlag, New York, 1971.
29. J.B. Conway, A Course in Functional Analysis, Springer-Verlag, New York, 1990.
30. Walter Rudin, Functional Analysis, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1973.
31. A. Wilansky, Functional Analysis, Blaisdell Publishing Co., 1964.
32. J. Tinsley Oden & Leszek F. Demkowicz, Applied Functional Analysis, CRC Press Inc., 1996.
33. A.H. Siddiqui, Functional Analysis with Applications, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

## COMPULSORY PAPER - II

### PARTIAL DIFFERENTIAL EQUATIONS AND MECHANICS

M.M. : 100

### PARTIAL DIFFERENTIAL EQUATIONS:

**UNIT-I** Examples of PDE. Classification.

Transport Equation-Initial value Problem. Non-homogeneous Equation. Laplace's Equation-Fundamental Solution, Mean Value Formulas, Properties of Harmonic Functions, Green's Function, Energy Methods. Heat Equation-Fundamental Solution, Mean Value Formula, Properties of Solutions, Energy Methods. Wave Equation-Solution by Spherical Means, Non-homogeneous Equations, Energy Methods.

**UNIT-II** Nonlinear First Order PDE-Complete Integrals, Envelopes, Characteristics, Hamilton Jacobi Equations (Calculus of Variations, Hamilton's ODE, Legendre Transform, Hopf-Lax Formula, Weak Solutions, Uniqueness), Conservation Laws (Shocks, Entropy Condition, Lax-Oleinik formula, Weak Solutions, Uniqueness, Riemann's Problem, Long Time Behaviour)

Representation of Solutions-Separation of Variables, Similarity Solutions (Plane and Travelling Waves, Solitons, Similarity under Scaling), Fourier and Laplace Transform, Hopf-Cole Transform, Hodograph and Legendre Transforms, Potential Functions, Asymptotics (Singular Perturbations, Laplace's Method, Geometric Optics, Stationary Phase, Homogenization), Power Series (Non-characteristic Surfaces, Real Analytic

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**OPTIONAL PAPER - III**  
**(I) GRAPH THEORY**

**M.M. : 100**

**UNIT-I** Operations on graphs, matrices and vector spaces:

Topological operations, Homeomorphism, homomorphism, contractions, derived graphs, Binary operations, matrices and vector spaces. The adjacency matrix, The determinant and the spectrum, Spectrum properties, The incidence matrix, cycle space and Bond space, Cycle bases and cycle graphs.

**UNIT-II** Colouring packing and covering:

Vertex coverings, critical graphs, Girth and chromatic number, uniquely colourable graphs, edge-colourings, Face colourings and Beyond, The achromatic and the Adjoint Numbers.

Setting up of combinatorial formulations, the classic pair of duals, Gallai, Norman-Rabin Theorems, Clique parameters, The Rosenfeld Numbers.

**UNIT-III** Perfect Graphs and Ramsey Theory:

Introduction to the "SPGC", Triangulated (Chordal) graphs, Comparability graphs, Interval graphs, permutation graphs, circular arc graphs, split graphs, weakly triangulated graphs, perfectness-preserving operations, Forbidden Subgraph orientations, Ramsey numbers and Ramsey graphs.

**UNIT-IV** Groups, Polynomials and Graph Enumeration:

Permutation groups, The automorphism group, graphs with given group, symmetry concepts, pseudo-similarity and stability, spectral studies of the Automorphism group. The colour polynomials, The chromatic polynomial, The bivariate colouring polynomials, co-chromatic (co-dichromatic) graphs and chromatically unique graphs, Graph Enumeration.

**UNIT-V** Digraphs & Networks:

Digraphs, Types of connectedness, Flows in Networks, Menger's and Konig's Theorem, Degree sequences.

**REFERENCES :**

1. K.R.Parthasarathy, Basic graph theory, Tata Mc graw Hill publishing company limited, 1994.
2. R.J.Wilson, Introduction to graph theory, Longman Harlow, 1985.
3. John Clark, Derek Allon Holton, A first look at graph Theory, World Scientific Singapore, 1991.
4. Frank Hararary, Graph Theory Narosa, New Delhi, 1995.
5. Ronald Gould and Benjamin Cummins, Graph Theory, California.
6. Narsingh Deo, Graph Theory with applications to Engineering and Computer Science, Prentice-Hall of India Private Limited, New Delhi, 2002.

**OPTIONAL PAPER - III**

**(II) Programming in C (with ANSI features)**  
**Theory and Practical (For regular students only)**

**M.M. : 70**

**UNIT-I** An overview of programming, Programming language, Classification, C Essential-Program Development. Functions. Anatomy of a "C" Function. Variables and

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Constants, Expressions, Assignment Statements, Formatting Source Files, Continuation Character, The Per-processor, Scalar Data Types-Declarations, Different Types of Integers, Different kinds of Integer Constants, Floating-Pint Types of Integers, Initialization, Mixing Types, Explicit Conversions-Casts, Enumeration types, The Void Data Type, Typesets, Finding the Address of an object, Pointers.

**UNIT-II**

Control Flow-Conditional Branching, The Witch statement, Looping, Nested Loops, The break and continue statements, The goto statement, Infinite Loops, 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 Operator, Size of Operators, Conditional Operator, Memory Operators.

**UNIT-III**

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

**UNIT-IV**

Storage Classes-Fixed vs. Automatic Duration, Scope, Global variables, The register Specifier, ANSI rules for the syntax and Semantics of the storage-class keywords, Dynamic Memory Allocation, Structures and Unions-Structures, Linked Lists, Unions, enum Declarations, Functions-Passing Arguments, Declarations and calls, Pointers to Functions, Recursion, The main Function, Complex Declarations.

**UNIT-V**

The "C" Pre-processor-Macro Substitution, Conditional, Include facility, Line Control, Input and Output-Streams, Buffering, The <Stdio.h> Header file, Error Handling, Opening and Closing a File, Reading and writing Data, Selection an I/O Method, Unbuffered I/O Random Access, The Standard library for Input/Output.

**REFERENCES :**

1. Paper A. Darnell and Philip E. Margolis, C : A Software Engineering Approach, Narosa Publishing House (Springer International student Edition) 1993.
2. Samuel P. Harkison and Gly L. Steele Jr., C : A Reference Manual, 2<sup>nd</sup> Edition, Prentice Hall, 1994.
3. Brian W. Kernighan & Dennis M. Ritchie, The C Programme Language, 2<sup>nd</sup> Edition (ANSI Features), Prentice Hall 1989.

**Practical based on the paper Programming in C (with ANSI features)**

**Schedule for Practical Examination**

Max. Marks :	30	Time Duration :	2 Hrs
Practical (two) :	20 Marks (10 Marks each)	Viva :	5 Marks
Sessional :	5 Marks		

**"Details of Practical Work"**

1. Write a program for Creating marksheet & Providing them grade.
2. Write a program for marking Pyramid of numbers.
3. Write a program for Calculating average & standard deviation.
4. Write a program for finding sum of series (Sin, Cos, Tan).

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5. Write a program for finding LCM of given numbers.
6. Write-a program for numerical solution of algebraic equation using Newton Raphson method.
7. Write a program for numerical integration of function applying Simpson one-third rule.
8. Write a program for sorting and strings using selection or insertion sorting technique.
9. Write a program to find product of two Matrix of any given order.
10. Write a program for finding inverse of Matrix of any order.
11. Write a program for to create the string functions "sullen", "stropy".
12. Write a program for writing & reading data from Text file.
13. Write a program for copy one file to another using command line argument.
14. Write a program for creating & storing of book record using following structure-
  - a. Book Acc No
  - b. Name
  - c. Title
  - d. Author
  - e. Publication
  - f. Date of Publishing.
15. Write a program for searching a particular book from book record, sorting of book record on the basis of accno or name.
16. Write a program for applying appending, deleting & modification of book record.
17. Write a program for solving congruence equations using Chinese remainder theorem.
18. Write a program for finding GCD of given integers using Euclid algorithm.
19. Write a program for find initial basic feasible solution of the transportation problem using Vogel's Approximation Method.
20. Write a program for sequencing problem processing jobs through k machines using Optimal sequence Algorithm.
21. Write a program for finding shortest path of a network using Dijkstra's algorithm.
22. Write a program for finding minimum spanning tree of a network problem using Kruskal's algorithm.
23. Write a program for find maximum flow through a network using MFP Algorithm.

#### OPTIONAL PAPER - IV

##### (I) OPERATIONS RESEARCH

M.M. : 100

- UNIT-I** Operations Research and its Scope. Necessity of Operations Research in Industry. Linear Programming-Simplex Method. Theory of the Simplex Method. Duality and Sensitivity Analysis.  
Other Algorithms for Linear Programming-Dual Simplex Method. Parametric Linear Programming. Upper Bound Technique. Interior Point Algorithm. Linear Goal Programming.
- UNIT-II** Transportation and Assignment Problems  
Network Analysis-Shortest Path Problem. Minimum Spanning Tree Problem. Maximum Flow Problem. Minimum Cost Flow Problem. Network Simplex Method. Project Planning and Control with PERT-CPM.
- UNIT-III** Dynamic Programming-Deterministic and Probabilistic Dynamic programming.

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

#### UNIT-IV

Integer Programming-Branch and Bound Technique.  
Applications to Industrial Problems-Optimal product mix and activity levels. Petroleum. refinery operations. Blending problems. Economic interpretation of dual linear programming. problems. Input-output analysis. Leontief system. Indecomposable and Decomposable economies.

#### UNIT-V

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 Research (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995. (This book comes with a CD containing tutorial software).
  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 & Sons, New York, 1990.
  5. H.A. Taha, Operations Research. An introduction, Macmillan Publishing Co., Inc., New York.
  6. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi.
  7. S.S. Rao, Optimization Theory and Applications, Wiley Eastern Ltd., New Delhi.
  8. Prem Kumar Gupta and D.S. Hira, Operations Research-An Introduction. S. Ciland & Company Ltd., New Delhi.
  9. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi, Madras
  10. UNDOSystems Products (Visit websHe <http://www.Hndo.com/productsf.html>)
    - a. UNDO (the linear programming solver)
    - b. UNDO Callable Library (the premier optimisation engine)
    - c. LINGO (the linear, non-linear, and integer programming solver with Mathematical modelling language)
    - d. What's Best ! (the spreadsheet add-in that solves linear, non-linear, and integer Problems).
- All the above four products are bundled into one package to form the Solver Suite. For more details about any of the four products one has to click on its name.
- e. Optimisation Modelling with UNDO (5<sup>th</sup> edition) by Linus Schrage.
  - f. Optimisation Modelling with LINGO by Unus Schrage.  
More details available on the Related Books page.

#### OPTIONAL PAPER - IV

##### (I) WAVELETS

M.M. : 100

- UNIT-I** Preliminaries-Different ways of constructing wavelets- Orthonormal bases generated by a single function: the Balian-Low theorem. Smooth projections on  $L^2(\mathbb{R})$ . Local sine

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and cosine bases and the construction of some wavelets. The unitary folding operators and the smooth projections. Multiresolution analysis and construction of wavelets. Construction of compactly supported wavelets and estimates for its smoothness. Band limited wavelets.

#### UNIT-II

Orthornormality. Completeness. Characterization of Lemarie-Meyer wavelets and some other characterizations. Franklin wavelets and Spline wavelets on the real line. Orthornormal bases of piecewise linear continuous functions for  $L^2(T)$ . Orthornormal bases of periodic splines. Periodization of wavelets defined on the real line. Characterizations in the theory of wavelets-The basic equations and some of its applications. Characterizations of MRA wavelets, low-pass filters and scaling functions. Non-existence of smooth wavelets in  $H^2(R)$ .

UNIT-IV  
Frames - The reconstruction formula and the Balian-Low theorem for frames. Frames from translations and dilations. Smooth frames for  $H^2(R)$ .

UNIT-V  
Discrete transforms and algorithms-The discrete and the fast Fourier transforms. The discrete and the fast cosine transforms. The discrete version of the local sine and cosine bases. Decomposition and reconstruction algorithms for wavelets.

#### REFERENCES:

1. Eugenic HermBndez and Guido Weiss, A First Course on Wavelets, CRC Press, New York, 1996.
2. C.K. Chui, An Introduction to Wavelets, Academic Press, 1992.
3. I.Daubechies, Ten Lectures on Wavelets, CBS-NSF Regional Confereones in Applied Mathematics, 61, SIAM, I 1992.
4. Y.Meyer,Wavelets, algorithms and applications (Tran.by R.D. Rayan,SIAM, 1993).
5. M.V. Wickerhauser, Adapted wavelet analysis from theory to software, Wellesley, MA, A.K. Peters, 1994.

#### OPTIONAL PAPER - V

##### (I) GENERAL RELATIVITY AND COSMOLOGY

M.M. : 100

#### UNIT-I

General Relativity-Transformation of coordinates. Tensors. Algebra of Tensors. Symmetric and skew symmetric Tensors. Contraction of tensors and quotient law. Riemannian metric. Parallel transport. Christoffel Symbols. Covariant derivatives, intrinsic derivatives and geodesies.

#### UNIT-II

Riemann Christoffel curvature tensor and its symmetry properties. Bianchi identities and Einstein tensor.

UNIT-III  
Schwarzschild external solution and its isotropic form. Planetary orbits and analogues of Kepler's Laws in general relativity. Advance of perihelion of a planet. Bending of light rays in a gravitational field, vitional redshift of spectral lines. Radar echo delay Energy-momentum-tensor of a perfect fluid. Schwarzschild internal solution. Boundary conditions. Energy momentum tensor of an electromagnetic field. Einstein-Maxwell equations. Reissner-Nordstrfm solution.

UNIT-IV  
Cosmology-Mach's principle, Einstein modified field equations with cosmological term.

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Static Cosmological models of Einstein and De-Sitter, their derivation, properties and comparison with the actual universe.

Hubble's law. Cosmological principles. Weyl's postulate. Derivation of Robertson-Walker metric. Hubble and deceleration parameters. Redshift. Redshiptf versus distance relation. Angular size versus redshift relation and source counts in Robertson-Walker space-time.

#### UNIT-V

Friedmann models. Fundamental equations of dynamical cosmology. Critical density. Closed and open Universes. Age of the Universe. Matter dominated era of the Universe. Einstein-deSitter model. Particle and even horizons. Eddington-Lamaitre models with I-term. Perfect cosmological principle. Steady state cosmology.

#### REFERENCES:

1. C.E. Weatherburn, An Introduction to Riemannian Geometry and the lensor Calculus, Cambridge University Press, 1950.
2. H. Stephani, General Relativity: An Introduction to the theory of the gravitational field, Cambridge University Press, 1982.
3. A.S. Eddington, The Mathematical Theory of Relativity, Cambridge University Press, 1965.
4. J.V. Narlikar, General Relativity and Cosmology, The Macmillan Company of India Urnited, 1978.
5. R. Adiev, M. Bazin, M. Schiffer, Introduction to general reUvity, McGraw Hill Inc., 1975.
6. B.F. Shutz, A first course in general relativity, Cambridge University Press,1990.
7. S. Weinberg, Gravitation and Cosmology: Principles and applications of the general theory of relativity, John Wiley & Sons, Inc. 1972.
8. J.V. Narlikar, Introduction to Cosmology, Cambridge University Press, 1993.
9. R.K. Sachs and H. Wu., General Relativity for Mathematician, Springer Verlag, 1977.
10. LD. Landau and E.M. Lifshitz, The classical theory of Fields, Pergamon Press, 1980.
11. J.L. Synge, Relativity: The general iteory. North Holland Publishing Company, 1976.

#### OPTIONAL PAPER - V

##### (II) FUNDAMENTALS OF COMPUTER SCIENCE

(Theory and Practical) (For regular students only)

M.M. : 70

#### UNIT-I

Object Oriented Programming-Classes and Scope, nested classes, pointer class members; Class initialization, assignment and destruction;

UNIT-II  
Overloaded functions and operators; Templates including class templates; class inheritance and subtyping, multiple and virtual inheritance.

UNIT-III  
Data Structures-Analysis of algorithms, q, W, O, o, w notations ; Lists, Stacks, and queues: Sequential and linked representations; Trees: Binary tree- search tree implementation, B-tree (concept only); Hashing-open and closed; Sorting: Insertion sort, shell sort, quick-sort, heap sort and their analysis.

#### UNIT-IV

Database Systems-Role of database systems, database system architecture; Introduction to relational algebra and relational calculus; SQL-basic features including views; Integrity constraints; Database design-normalization upto BCNF.

#### UNIT-V

Operating Systems-User interface, processor management, I/O management, memory management, concurrency and Security, network and distributed systems.

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- REFERENCES :**
1. S.B. Lipman, J. Lajoi: C++ Primer, Addison Wesley.
  2. B. Stroustrup; The C++ Programming Language, Addison Wesley.
  3. C.J. Date : Introduction to Database Systems, Addison Wesley.
  4. C. Rifehie: Operating Systems-Incorporating UNIX and Windows, BPB Publications.
  5. M.A. Weiss, Data Structures and Algorithm Analysis in C++, Addison Wesley.

**Practical based on the paper FUNDAMENTALS OF COMPUTER SCIENCE**

**Schedule for Practical Examination**

2 Hrs

Time Duration

20 Marks (10 Marks each)

Max.Marks : 30

Practical (two)

one from each section

Viva

5 Marks

Sessional

5 Marks

**"Details of Practical Work"**

**Section-A**

**CPP PROGRAM**

1. Write a program that perform push, pop and display operations into stack.
2. Write a program that perform insert, delete and display operations into queue.
3. Write a program that convert any expression into reverse polish notation.
4. Write a program that perform addition, subtraction and Transpose operations into Matrix.
5. Write a program that performs addition of sparse matrix.
6. Write a program that perform sorting of link list.
7. Write a program for creating Binary search tree and perform Inorder, Preorder and postorder traversing operation.
8. Write a program for reverse of link list
9. Design a template for sorting different data type.
10. Write a program for selection sort.
11. Write a program for merging.
12. Write a program for insertion sort.
13. Write a program for bubble sort.
14. Write a program for Merge sort.
15. Write a program for quick sort.
16. Write a program for Heap sort.

**Section-B**

**OPERATING SYSTEM COMMANDS -**

1. Use various option of ls Commands
2. Use the commands pwd, cd, rmdir, mkdir and mv commands.
3. Use command chmod.
4. Write a shell script for display fibonacci series of number
5. Write a shell script of find out factorial of given no.
6. Write a shell script for checking palindrome.

**RDBMS Assignment -**

1. Create the following table

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- i) Employee (fname varchar (15), lname varchar (15), ssn Char (9), Bdate, Address Varchar (20), sex char, salary Decimal (10,2), superssn char (9), Dno int).
- ii) Department (Dname varchar (15), Dnumber int, Mrgesn Char (9), Mgrstartdate date)
- iii) Project (Pnumber int, pName Varchar (15), Plocation varchar (15), Dnum Int)
- iv) Works\_on (essn char (9), Pho integer, Howrs decimal (4,1)
- v) Dependent (Eesn Chov (9), Dependent-name varchar (15), sex char, Bdata date, Relationship varchar (8))

2. Alter table employee and add one field job varchar (12).
3. Use insert command to insert data in above table.
4. REtrieve the Birthdata and address of employee whose name is John B. Smith.
5. Retrieve the name and address of all employee who works for the 'Research' Department.
6. Write the name of employees whose address in University Campus (like function).
7. Find all the employees who were born during the 1950s.
8. Write the name of employees whose salary is between 10,000 to 20,000.
9. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
10. Retrieve the name of employee who have no dependent.
11. Find the sum of the salaries of all employees, the maximum salary and the minimum salary.
12. Find the sum of the salaries of all employees of the 'Research' department as well the maximum and minimum salary.
13. Retrieve the department number the no. of employee in each department and their aggregate salary.
14. Write query to delete all the employee whose name start with the character 'a'.
15. Use command commit rollback.

**OPTIONAL PAPER - V**

**(II) FUZZY SETS AND THEIR APPLICATIONS**

M.M. : 100

**UNIT-I** Fuzzy sets-Basic difinitions, n-level sets. Convex fuzzy sets. Basic operations on fuzzy sets. Types of fuzzy sets. Cartesian products. Algebraic products. Bounded sum and difference, t-norms and t-conorms. The Extension Principle- The Zadeh's extension principle. Image and inverse image of fuzzy sets.

**UNIT-II** Fuzzy numbers. Elements of fuzzy arithmetic. Fuzzy Relations and Fuzzy\_Graphs-Fuzzy relations on fuzzy sets. Composition of fuzzy relations. Min-Max composition and its properties. Fuzzy equivalence relations. Fuzzy compatibility relation. Fuzzy graphs. Similarity relation.

**UNIT-III** Fuzzy relation equations. Possibility Theory-Fuzzy measures. Evidence theory. Necessity measure. Possibility measure. Possibility distribution. Possibility theory and fuzzy sets. Possibility theory versus probability theory.

**UNIT-IV** Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions, the compositional rule of inference. Approximate Reasoning-An overview of Fuzzy expert system. Fuzzy implications and their selection. Multiconditional approximate reasoning. The role of fuzzy relation equation.

**UNIT-V** An introduction to Fuzzy Control-Fuzzy controllers. Fuzzy rule base. Fuzzy inference

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engine. Puzzfication. Defuzzification and the various defuzzification methods (the centre of area, the centre 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. H.J. Zmmermann, Fuzzy set theory and its Applications, Allied Publishers Ltd. New Delhi, 1991.
2. G.J. Klir and B. Yuan- Fuzzy sets and fuzzy logic, Prentice-Hall of India, New Delhi, 1995.

M.A./M.Sc. Final

**ANTHROPOLOGY**

There will be two specializations in M.A./ M.Sc. Final.

**Group A - Physical Anthropology.**

**Group B - Social Anthropology.**

**GROUP - A (PHYSICAL ANTHROPOLOGY)**

The physical Anthropology specialization will consist of three theory papers, two practicals and one dissertation.

Typed copies of Dissertation shall be submitted by the student under the guidance of the teacher designated for this purpose by the Head and examined by the external examiner appointed by the University.

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**SCHEME OF EXAMINATION**

<b>GROUP - A (PHYSICAL ANTHROPOLOGY)</b>			
<b>Compulsory Papers</b>			
<b>A - Theory Papers</b>			
SL. NO.	PAPER	NAME OF PAPER	MAXI. MARKS
1	Paper I	Applied Anthropology (Group A & B)	100
2	Paper II	Human Genetics	100
3	Paper III	Human Growth and Nutrition	100
<b>B - Dissertation</b>			
4	Paper IV	Field based Dissertation (Independent Research)	100
<b>C - Practicals</b>			
5	Paper V	Laboratory based Practical	100
6	Paper VI	Practical in Applied Biological Anthropology	100
		Total	600
<b>GROUP - B (SOCIAL ANTHROPOLOGY)</b>			
<b>Compulsory Papers</b>			
<b>A - Theory Papers</b>			
1	Paper I	Applied Anthropology (As in Group - A)	100
2	Paper II	Theory and methods in Social Cultural Anthropology	100
3	Paper III	Indian Anthropology	100
4	Paper IV	Development Anthropology	100
5	Paper V	Tribal Development.	100
<b>B- Dissertation</b>			
6	Paper VI	Community based Dissertation (Independent Research)	100
		Total	600

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**M.A. / M.Sc. Final Anthropology**  
**PAPER - I : APPLIED ANTHROPOLOGY**  
**(GROUP A & B)**

**UNIT-I** Meaning and Scope of Applied Biological Anthropology.

1. Anthropology of Sports.
2. Nutritional Anthropology.
3. Designing of defence equipments.
4. Defence Services.
5. Forensic Anthropology

**UNIT-II** Applications of Human genetics: Medico- Legal genetics, Eugenics, Forensic applications, genetic screening, Genetic counselling, Genetic engineering.

**UNIT-III** Gene expression: Transcription & Translation, basic molecular techniques, current status on molecular genetics and its applications. Human Genomics & its applications.

**UNIT-IV** Meaning & scope of Applied and action Anthropology. Historical Development of the concept of applied & action anthropology, Applied anthropology in industry, applied anthropology in education, applied anthropology in administration.

**UNIT-V** Application of Anthropological theory and methodology in the field of tribal development, education, public health, National health programmes.

**Recommended Readings:**

1. Kroeber. Anthropology Today.
2. Curt Stern. 1968. Principles of Human Genetics. Eurasia Publishing House (Pvt.) Ltd., Ram Nagar, New Delhi-1 (India).
3. Steine. Biosocial Genetics.
4. Karp, E. Genetic Engineering.
5. Bodmer and Cavalli-Sforza. Genetics of Human Populations.
6. Strachan, T. and Read, A.P. 1999. Human Molecular Genetics. BIOS Scientific Publishers Ltd, Oxford. (574.8732, STT H, 84237).
7. Backer, PT and Weiner (Eds), The Biology of Human Adaptability.
8. Beal, Virginia, Nutrition and the Life Span
9. Beutler, E., Red Cell Metabolism: A Manual of Biochemical Methods
10. Brock and Mayo, The Biochemical Genetics of Man
11. Craig, Human Development
12. Burdette, WJ, Methodology in Human Genetics
13. Emery, AEH, Elements of Medical Genetics
14. Eveleth, PB and Tanner, JM Worldwide Variation in Human Growth
15. Forbes, GB, Human Body Composition
16. Sodhi, HS, Sports Anthropology
17. Willigt, JV, Applied Anthropology: An Introduction
18. Crow, J.F. & Kimura, M., An Introduction to Population Genetic Theory.
19. Stern, C., Principles of Human Genetics.
20. Winchester, A.M., Human Genetics.
21. Giblett, E.R., Genetics Markers in Human Blood.
22. Bhende and Kanitkar, Principles of Population Studies.
23. Cox, Peter, Demography.
24. Houser & Duncan, The Study of Population.
25. Shryock and Shryock, Methods and Materials of Demography

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26. Shukla, B.R.K. & Rastogi, S., Physical Anthropology and Human Genetics An Introduction.
27. McKusick, V.A., Human Genetics.
28. Li, C.C., Human Genetics
29. Malhotra, K.C. & ISHG, Calcutta, Statistical Methods in Human Population Genetics, IBRAD, ISI
30. Wright, S., Evolution and Genetics of Population
31. Harrison, G.A. & A.J. Boyce, Structure of Human Population.
32. Stanfield, W.D., Theory and Problems of Genetics.
33. Bhamath, H.S. & Chaturvedi, C.M., A Textbook of Genetics.
34. Rieger, R. et al., Glossary of Genetics – Classical and Molecular
35. Mange, J.E. & Mange, A.P., Basic Human Genetics. Rothwell, N.V., Human Genetics.

**M.A. / M.Sc. Final Anthropology**  
**PAPER - II - HUMAN GENETICS**  
**GROUP - A**

**UNIT-I** (1) History and development of Human Genetics.  
 (2) Methods of studying Heredity.

- (I) Pedigree Method.
- (II) Twin Method.

Principles and mechanism of Heredity, genes, chromosomes, Structure and functions of DNA, RNA and Proteins, genetic code, Gene Enzyme Hypothesis. Modes of inheritance:- Autosomal, Dominant and Recessive, Sex linked and Polygenic inheritance.

**UNIT-II**

Mutation and Selection in Human population. Inbreeding co-efficient.

Polymorphism - Transient and Balanced.

Population genetics in the Indian context, endogamous population as unit of study, castes and caste cluster.

**UNIT-III**

(1) Concept of gene pool and gene frequency probability.

(2) Hardy-Weinberg equilibrium and its application.

(3) Breeding population- mating pattern, Random mating, Assortative mating.

(4) Multiple allele and blood group ABO blood group and A1, A2 BO, MNSS systems and Rh blood group.

(5) Compatible and incompatible mating.

**UNIT-IV** (1) Human Chromosome.

(2) Normal human chromosome karyotype: Banding Techniques.

(3) Numerical and structural chromosomal abnormalities.

(4) Genetic counselling.

(5) Inborn errors of metabolism.

(6) Mutation and genetic hazard of radiation.

**UNIT-V** (1) Concept of gene and its expression, replication, transcription, translation.

(2) DNA technology.

(3) Genetic engineering, Human genome Project.

**Recommended Readings:**



Communicable & Non-communicable diseases. Health and nutrition education - at home and for community.

**Recommended Readings:**

1. Tanner, J. M. 1962. Growth at Adolescence, Blackwell Scientific Publications, Oxford.
2. Lowrey, G. H. 1978. Growth & development of children, Year book Medical Publishers, Chicago - London.
3. Swaminathan, M. 1985. Essentials of Food and Nutrition, The Bangalore Printing and Publishing Co. Ltd.
4. Gopalan, C., Rama Sastri, B., V. & Balasubramanian, S., C. 2002. Nutritive value of Indian foods, National Institute of Nutrition, ICMR, Hyderabad.
5. Parasmani dasgupta and Roland Hauspie , 2001. Perspectives in Human Growth, Development and Maturation, Kluwer Academic Publishers, London.
6. Marshall, W. A. 1977. Human Growth and its Disorders, Academic Press, London.
7. Harrison, G.A., Weiner, J.S., Tanner, J.M. and Barnicot, N.A. Human Biology: An Introduction to Human Evolution, Variation And Growth, Clarendon Press, Oxford.
8. Tanner, J.M., Fetus into Man.
9. Jelliff, D.B., Community Nutritional Assessment with Special Reference to Less Developed Countries.
10. Dixit. Human Nutrition: Principles and Applications in India.
11. Shanti, G. Nutrition and Child Care: A Practical Guide.
12. B. Sriaxmi, Nutrition Science.
13. Margart Schay, Nutrition.
14. Rao, V.K.R.V. Food Nutrition and Poverty.
15. Nelson, A Text Book of Pediatrics
16. Garrow, J.S. and James, W.P.T: Human Nutrition and Dietetics.
17. Swaminathan, M., Essentials of Food and Nutrition: Applied Aspect

**M.A. / M.Sc Final Anthropology**  
**PAPER – IV - FIELD BASED DISSERTATION**  
**GROUP - A**

(Independent Research)

**APPROACH**

The course is designed to make the student carry out independent research in the planning of the projects proposal, data collection, data analysis and report writing. Using conventional and scientific methods at various stages of the field dissertation. The course aims at capacity building of the student in taking up independent research programmes. The students are required to work with the community for a period not less than one month in the village.

**At the end of the course the students would be in a position to:**

- a. Locate archaeological site through conventional and scientific methods, viz, place names, topo sheets, aerial photographs, remote sensing and other techniques.
- b. Collect data pertaining to culture, faunal, floral, remains and climatic makers from the identified archaeological site; surfaces collection, excavation.
- c. Adopt a holistic approach in interpreting data: geomorphological/sedimentological, ethnographic nature along with archaeological data.
- d. Compile the analysed data and present in the form of a report.

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1. Curt Stern. 1968. Principles of Human Genetics. Eurasia Publishing House (Pvt.) Ltd., Ram Nagar, New Delhi-1 (India).
2. Winchester, A. M. 1967. Genetics, Oxford & IBH Publishing Co.
3. Bhasin, V. 1994. People, Health and Disease: The Indian Scenario, Kamla- Raj Enterprises, Delhi.
4. Bhasin, M., K., Walter, H. and Danker-Hopfe, H. 1992. The Distribution of Genetical, Morphological and behavioural Traits among the Peoples of Indian Region, Kamla- Raj Enterprises, Delhi.
5. Bhamrah and Chaturvedi, A Text Book of Genetics.
6. Mange and Mange, Basic Human Genetics.
7. Rothwell, N.V., Human Genetics.
8. Harrison et al. Human Biology.
9. Ashley Montagu, Concept of Race.
10. Shukla, B.R.K. & Rastogi, S., Physical Anthropology and human Genetics.
11. Dalela and Verma, T Text Book of Genetics.
12. Bodmer & Cavalli Sforza, Genetics, Evolution and Man.
13. King and Stansfield: A Dictionary of Genetics.
14. Brudette, W.J., Methodology in Human Genetics.
15. Yunis, J.J. (Ed.), Biochemical Methods in Red Cell Genetics.
16. Harris, H., Human Biochemical Genetics.

**M.A. / M.Sc. Final Anthropology**

**PAPER- III - HUMAN GROWTH AND NUTRITION**  
**GROUP – A**

**UNIT-I** Human growth and development: pre-natal and post-natal definition, adolescence, adulthood, senility, Human growth curves; Basic methods of growth studies-cross-sectional, longitudinal, mixed longitudinal.

**UNIT-II** Factors affecting growth, hereditary factor, Hormonal factor and Environmental factor. Concept of age: chronological, skeletal, dental, morphological and based on body size; Changing human growth patterns i.e. secular trend.

**UNIT-III** Nutrition: Basic terms and concepts; Socio-cultural attributes of foods; hot, cold, preferences and avoidance; Nutrition, nutrients, malnutrition, undernutrition, overnutrition, obesity etc. Special problems related to growth and nutrition-growth at risk; infants, pregnant and lactating mothers, old age problems, birth weight variations; Abnormal growth failure: Anthropometric; clinical signs, bio-chemical health; diet and nutrition; socio-economic assessment, evaluation, monitoring and surveillance; concept of standard and/or reference values of growth and nutritional status.

**UNIT-IV** Growth & Nutrition programme ANP, ICDS, SNP, mid-day meal programme; vitamin-A prophylaxis programme, Problems of nutritional deficiencies, nutritional anemia, prophylaxis programme, goiter control programme, nicotinic acid deficiency, vit.-C, Vit.-D deficiency. Problems of malnutrition, morbidity and mortality (perinatal, neonatal), IMR- role of maternal education, infections.

**UNIT-V** Health Epidemiology: definition & scope. Uses-analytical Epidemiology-case control study and cohort study-screening for disease-general concepts.

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**M.A. / M.Sc. Final Anthropology**  
**PAPER – V - GENERAL PRACTICALS IN ANTHROPOLOGY**  
**GROUP - A**

1. Relevance of craniometry, craniotomy and osteometry in Physical Anthropology. Normal & Abnormal varieties.
2. Basic instruments especially used for craniometry and osteometry.
3. Drawing of at-least three craniograms.
4. Craniometric measurements (30 measurements) glabella -inion length, least frontal Breadth, outer Bi-orbital breadth, inner bi-orbital breadth, Nasion-basion line, inion Basion line, Maxillo-alveolar breadth, Maxillo-alveolar length, Palatal breadth, Palatal length, Breadth of occipital foramen, length of occipital foramen. Sagittal cranial arc, Frontal arc Parietal arc, occipital arc, Horizontal circum fence, Greatest occipital breadth, Auriculo-bregmatic height, basion bregmatic height, orbital breadth, Bi-auricular breadth, Nasion prosthion line, Nasion- inion length, Nasion-gnathion line, Nasion-prosthion line, Greatest occipital breadth, Maximum cranial length, Maximum cranial breadth.
5. Measuring directly and indirectly at least 5 angles on crania.  
 Facial profile angle, profile angle of nasal roof, nasal profile angle, facial profile angle, alveolar profile angle.
6. Cranial index, Nasal index.
7. Mandibulometry (8measurements)  
 Condylar breadth, Bigonial breadth, symphyseal height, height of ramus, mandibular length, Minimum breadth of ramus.  
 Osteometric measurements.  
 Clavicle.  
 (1) Maximum length, vertical diameter in the middle, Sagittal diameter in middle, Girth in the middle, Breadths of curvature of shaft.  
 Angles (1) inner and outer.  
 Indies (1) Caliber index and cross section index.

**SCAPULA**

Anatomical breadth, anatomical length, length of Cranial border, length of axillary border, project length of spine, anatomical breadth of supraspinous fossa, Anatomical breadth of infraspinous fossa, length of glenoid fossa, Breadth of glenoid fossa, projective breadth of supraspinous fossa, projective breadth of infra spinous fossa.

**ANGLES:**

Indices: Scapular index, supra spinal index, infra spinal index, marginal index, Length breadth index of glenoid fossa.

**HUMERUS**

Maximum length, Breadth of proximal epiphysis, Breadth of distal epiphysis, least girth of shaft, Maximum transverse diameter of head, Max. Vertical diameter of Head, Max. Diameter in middle, Girth in middle of shaft, minimum diameter in middle.

**ANGLES:**

Torsion angle, capito-diaphysial angle, condylo-diaphysial angle.

**INDICES:**

Caliber index, cross-section index of shaft, cross-section index of head.

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**RADIUS**

Maximum length, physiological length, least girth of shaft, transverse diameter of shaft, Sagittal diameter of shaft.

**ANGLES:**

Collo-diaphysial angle, torsion angle.

**INDICES:**

Caliber index, Cross section index of shaft, curvature index.

**ULNA:**

Maximum length, physiological length, least girth of shaft, Breadth of olecranon, Height of olecranon.

**ANGLES:**

olecranon- coronoid angle, joint axis angle.

**INDICES:**

Caliber index, cross-section index of shaft, curvature index.

**FEMUR**

Maximum length, trochanteric length, Sagittal diameter of middle of shaft, physiological length, transverse diameter of middle shaft, Girth of middle of shaft.

**ANGLE:**

Torsion angle, collo-diaphysial angle, Condylo diaphysial angle.

**M.A. / M.Sc. Final Anthropology**

**PAPER – VI - PRACTICALS IN APPLIED BIOLOGICAL ANTHROPOLOGY**  
**GROUP - A**

1. Collection of blood specimens.
2. Preparation of Hemolysates and serum & their storage.
3. Preparation & identification of Haem in Crystals.
4. Techniques of blood grouping: ABO blood group system Rh, blood group system & MN blood group system. Calculations of their relative gene frequencies.
5. Test of ABH saliva secretion.
6. Test of Hemoglobin determination in human blood.
7. Test for Sickle cell hemoglobin.
8. Test for colour blindness, P.T.C. taste sensitivity.
9. Examination of R.B.C. in Human Blood.
10. Examination W.B.C. in Human Blood.
11. Analysis of disputed paternity & maternity cases on the basis of blood groups.

**NOTE:** Ten specimens to be analysed by each student in the above mentioned traits unless stated otherwise.

**FORENSIC ANTHROPOLOGY: DERMATOGLYPHICS**

1. Techniques of taking finger, palm, sole and toe prints.
  2. Identification of dermatoglyphics patterns.
  3. Quantitative dermatoglyphics.
  4. Dermatoglyphic Indices.
  5. Palmar Crease: Analysis of palmar 'Flexion' 'Creases': Types & subtypes.
- NOTE:** Twenty specimens to be analysed by each student in the above mentioned traits unless stated otherwise.

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### Recommended Readings:

1. Race, R. R. & Sanger, R. 1968. Blood group in man. Blackwell Scientific Publications, Oxford. (612.11825, RAR).
2. Kathleen E. Boormen and Barbara E. Dodd. An Introduction to Blood group Serology (612.11825, BOK).
3. Bhasin, M. K. and Chahal, S. M. S. 1996. A Laboratory Manual for Human blood Analysis, Kamla Raj Enterprises, Delhi.
4. Kamlavastava, B. K. 1983. A Manual of Practical Physiology, Samit Medical Publications, Patna.
5. Dacie, J. V. and Lewis, S. M. 1991. Practical haematology. 5<sup>th</sup> edition, J. and A. Churchill, Livingstone.

### M.A. / Final M.Sc Anthropology

#### (GROUP A & B)

### GROUP-B (SOCIAL ANTHROPOLOGY)

#### PAPER - I : APPLIED ANTHROPOLOGY

**UNIT-I** Meaning and Scope of Applied Biological Anthropology.  
Applied Anthropometry in the context of designing of defence equipments, furnitures, uniforms, readymade garments, artificial limbs and foot-wear.  
Aerospace and Aviation Application.

Anthropometry and sports:-

**UNIT-II** Applications of Human genetics: Medico- Legal genetics, Eugenics, Forensic applications, Genetic screening, Genetic counselling, Genetic Engineering.  
**UNIT-III** An overview of molecules involved in the flow of genetic information, basic molecular techniques, current status on molecular genetics and its applications. Human Genomics & its applications.

**UNIT-IV** Meaning and Scope of Applied Social Anthropology.

Development of the concept of applied & action anthropology. Applied anthropology in industry, applied anthropology in education.

**UNIT-V** Application of Anthropological theory and methodology in the field of tribal development; education, public health, National health programmes.

### Recommended Readings:

36. Kroeber. Anthropology Today.
37. Curt Stern. 1968. Principles of Human Genetics. Eurasia Publishing House (Pvt.) Ltd., Ram Nagar, New Delhi-1 (India).
38. Steine. Biosocial Genetics.
39. Karp, E. Genetic Engineering.
40. Bodmer and Cavalli-Sforza. Genetics of Human Populations.
41. Strachan, T. and Read, A.P. 1999. Human Molecular Genetics. BIOS Scientific Publishers Ltd, Oxford. (574.8732, STT H, 84237).
42. Backer, PT and Weiner (Eds), The Biology of Human Adaptability.
43. Beal, Virginia, Nutrition and the Life Span
44. Beutler, E., Red Cell Metabolism: A Manual of Biochemical Methods
45. Brock and Mayo, The Biochemical Genetics of Man
46. Craig, Human Development

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47. Burdette, WJ, Methodology in Human Genetics
48. Emery, AEH, Elements of Medical Genetics
49. Eveleth, PB and Tanner, JM Worldwide Variation in Human Growth
50. Forbes, GB, Human Body Composition
51. Sodhi, HS, Sports Anthropology
52. Willigt, JV, Applied Anthropology: An Introduction
53. Crow, J.F. & Kimura, M., An Introduction to Population Genetic Theory.
54. Stern, C., Principles of Human Genetics.
55. Winchester, A.M., Human Genetics.
56. Giblett, E.R., Genetics Markers in Human Blood.
57. Bhende and Kanitkar, Principles of Population Studies.
58. Cox, Peter, Demography.
59. Houser & Duncan, The Study of Population.
60. Shryock and Shryock, Methods and Materials of Demography
61. Shukla, B.R.K. & Rastogi, S., Physical Anthropology and Human Genetics An Introduction.
62. McKusick, V.A., Human Genetics.
63. Li, C.C., Human Genetics
64. Malhotra, K.C. & ISHG, Calcutta, Statistical Methods in Human Population Genetics, IBRAD, ISI
65. Wright, S., Evolution and Genetics of Population
66. Harrison, G.A. & A.J. Boyce, Structure of Human Population.
67. Stanfield, W.D., Theory and Problems of Genetics.
68. Bhamrah, H.S. & Chaturvedi, C.M., A Textbook of Genetics.
69. Rieger, R. et al, Glossary of Genetics - Classical and Molecular
70. Mange, J.E. & Mange, A.P., Basic Human Genetics.
71. Rothwell, N.V., Human Genetics.

### M.A. / M.Sc. Final Anthropology

### PAPER - II - THEORY & METHODS IN SOCIAL CULTURAL ANTHROPOLOGY

#### GROUP-B

#### Approach

Anthropology has remained preoccupied with evolution, diffusion and structural functional approach. New theoretical constructs and methods such as Marxist Anthropology, psycho-analytical approach, cognitive Anthropology, post-modernist approaches and concepts like ethnicity are now being discussed in contemporary anthropology. In Anthropology there is discussion about methods, paradigms and models in addition to formulation and empirical verification of hypothesis to be field tested. The central focus of anthropology of holistic perspective, and empirical studies has ever continued. In his course, concepts and theories are to be understood in terms of contributions of authors and scholars.

**At the end of the course, students are expected to:**

- a. Critically assess theoretical contributions of Anthropologists.
- b. Understand various concepts and theories and their interpretations in traditional areas of Anthropology and contemporary issues.
- c. Develop a critical vision about future of Anthropology as integrative and interdisciplinary science of Man.

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- d. Evaluate the role of Anthropologists as scientists, as humanist, and as citizens of a nation.
- e. Understand the interaction of micro and macro paradigms of development.

### Theory and Methods in Social-Cultural Anthropology.

#### SYLLABUS

##### UNIT-I History of Anthropological Thought: classical schools

Pioneers in Anthropology.

Evolutionism: Morgan, Tylor.

Diffusionism: Elliot Smith, Graebner.

Historical Particularism: Boas, Wissler, Kroeber.

##### UNIT-II Structural-functionalism: (Rad-Cliffie Brown, Evans Pritchard, Raymond Firth, Nadel.)

Neo-evolutionism: (Leslie White, Julian, Sahlin)

Psychological Anthropology.

Culture and personality studies: Kardiner, Linton, Benedict, Coradu-Bois, Margaret Mead.

##### UNIT-III Philosophical anthropology: Concept of Value Cultural Relativism, Value and human rights: Herskovits.

Historical and Dialectical Materialism: Hegel, Marx and Engels.

Anthropological theory and method for policy planning and applications.

##### UNIT-IV Concept of "Primitive" and "Native" in Anthropology. Dilemma of "We" and "They" in research. "Primitive" as a conceptual model in Anthropological research. Ethnographic method for policy planning and intervention.

Synthesizing micro and macro paradigms of development.

Policy Planning Issues: education, health marginal people, environment.

Autonomous nature of Anthropology: Integration of scientific and humanistic approaches

Anthropologist as scientist, citizen and humanist.

#### Recommended Readings:

1. Evans-Pritchard, A History of Anthropological Thought.
2. Harris, Marvin Rise of Anthropological Theory. Routledge & Kegan Paul, London.
3. Bidney, David Theoretical Anthropology. Columbia University Press, New York.
4. Gertz, Clifford The Interpretation of Culture.
5. Manners, R.A. & David Kaplan (Eds.) Theory in Anthropology.
6. Malinowski Scientific Theory of Culture and Other Essays.
7. Redfield R. Human Nature and the Study of Society.
8. Redfield, Robert Peasant Society and Culture.
9. Steward, Julian H. Contemporary Change in Traditional Societies.

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### M.A. / M.Sc. Final Anthropology PAPER- III - INDIAN ANTHROPOLOGY

#### GROUP - B

##### UNIT-I

Ancient culture: Prehistoric Culture of India (Paleolithic, Mesolithic and Neolithic), Protohistoric (Indus civilization), Vedic and later Vedic age, Harappa and Mohenjodaro, Unity and diversity in Indian society and culture : linguistic, political, ethnic, communal and religious tensions and conflicts ; national integration .

##### UNIT-II

Social structure: caste system-definition and criteria of caste system, Varna and caste, Caste among non-Hindus, Caste outside India; dominant caste-mobility fusion, lack of fusion and fission. Backward castes and Scheduled caste: Statutory provisions, Caste and Tribe.

##### UNIT-III

Anthropological approach to the study of complex society. Indian Civilization: anthropological perspectives—Singer, Cohn, N.K. Bose and Vidyarthi.

##### UNIT-IV

Concept of peasant society and peasant culture: Indian village as a peasant society. Studies of rural and peasant societies. Folk urban continuum; Idea of rural analysis.

##### UNIT-V

Great tradition and Little tradition; Sacred complex.; textual and contextual approaches. Studies on institutions in complex societies. Family, kinship and political institutions.

Social network analysis.

#### Recommended Readings:

1. Alchin, B. & Alchin, R. The Rise of civilization in India and Pakistan, Cambridge University Press
2. Karve, Iravati. Hindu Society- An interpretation.
3. Mandel boum, D. Society in India.
4. Marriot, M. Village India – Studies in the Little Community.
5. Singh, K. People of India – An Introduction. Anthropological Survey of India.
6. Leach, E.R. Aspects of caste in South India, Ceylon and North- West Pakistan.
7. Singer, M. When a Great Tradition Modernizes.
8. Srinivas M. N. Social change in modern India.
9. Nadeem Hasnain. Indian Anthropology.
10. Jha and Baranwal. Indian Anthropology.
11. Basu, T. M. Indian Museum Movement, A. K. Banerjee 89, Mahatma Gandhi Road, Calcutta – 7.
12. Zeheer M. Museum Management, Ram Advani Book.
13. Aiyppan, A. & Satyamurthy, S. T. Handbook of Museum Technique, Govt. of Madras Publication, Gupta Brothers Vishakhapatnam.
14. Markham, S. F. & Hargreaves, H. The Museum of India.
15. Ghosh, D. P. Problems & Trends in Museology
16. Choudhary, J. The Ethnographical collection & their display.
17. Blanderleith, N. J. The Conservation & Antiquities of works and Art.
18. UNESCO (Pub.) A Quarterly Review, Ministry of Education & Social welfare Museum.
19. Agnihotri, V. 2003. Manav aur uski. Bhotik Sanskriti (in Hindi), K.K. Publications, Allahabad.
20. Karve, Iravati, Kinship organization in India.
21. Sankalia, H.D., Pre and Proto History of India and Pakistan, Pune, Deccan College.

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22. Vidyarthi, L.P. Sacred Complex of Kashi, A Microcosm of Indian Civilization, New Delhi, Concept Publication.
23. Haimendorf, C., Tribes of India, the Struggle for Survival.
24. Singh, K.S., Tribal Society in India.
25. Dube, S.C., India's Changing Villages.

**M.A. / M.Sc. Final Anthropology**  
**PAPER - IV - DEVELOPMENT ANTHROPOLOGY**  
**GROUP - B**

**UNIT-I** Development: Meaning and Evolution of the Concept Development theories and Models. Applied, Action and Development Anthropology: Meaning, Scope and the emergin trends, contributions of anthropology to development studies.

**UNIT-II** Development study's contributions to anthropological thought and Method. Moral/Ethical Issues and limitations of development Anthropology. Role of Values and Institutions in development: Caste, religion and Culture.

**UNIT-III** Rural Development in India: Historical Background. Special Programmes and Poverty alleviation Programmes. Land reforms, Panchayati Raj, Community based Organisations.

**UNIT-IV** Development of Scheduled Castes, Scheduled Tribes: Special component plans. Development of Scheduled Tribes: Constitutional provisions and safeguards, Protective legislation; Structure of tribal development administration, Evolution of tribal Sub Plans, Problems and Prospects of tribal development.

**UNIT-V** Sustainable development: Environment, natural resources, People Concerns and needs.

- (i) Problems of Development: Dams, Pollution, Environment.  
 (ii) Ecology Disaster.  
 (iii) Urbanization - Slums.

**Recommended Readings:**

1. Zamara, D. Mario. Perspectives on cultural change and Development.
2. Vorhies et al. The Politics of Hunger
3. Rogers Everll . Communication and Development: Critical Perspectives
4. Chambers Robert. Rural Development
5. Kapoor & Singh. Rural Development Through NGOs
6. Cochrne. Development Anthropology
7. Dalton, George (Ed.). Economic Development and Social change
8. Foster, G. M. Traditional Cultures and Impact of Technological change
9. Chansarkar, B. A. Models for Planning in India
10. Krishnamachari, V. T. Community Development in India
11. Tax Sol. Action Anthropology
12. Vidyarthi L.P. (Ed.). Applied Anthropology in India
13. Upadhyay, V. S. & Pandey Gaya. Vikasatmak Manavvigan (in Hindi), Madhya Pradesh Hindi Granth Academy, Bhopal.

**M.A. / M.Sc. Final Anthropology**  
**PAPER - V - TRIBAL DEVELOPMENT**  
**GROUP - B**

**UNIT-I** Definition of tribe and tribal development and scheduled tribe

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Distribution of scheduled tribes. Demographic trends. Classification and characteristics of tribal regions. Linguistic classification of scheduled tribes.

**UNIT-II** Tribal Policy: Tribal Policy, regulatory and development measures during British India. Indian Constitution- Safeguards and Provisions for scheduled tribes: Socio-cultural, Economic, Educational, Political services. etc. Administration of Scheduled Areas (Fifth schedule to the constitution), Tribal Areas (Sixth schedule to the constitution) and tribal majority states Important regulation promulgated by Governors in Schedule Areas.

**UNIT-III** Tribal Economy: Forests- shifting cultivation Forest department its policy, Acts and regulations, Joint forest management, tribal agriculture land holdings-land rights-land tenures land reforms-adaptation of modern agriculture technology. village and cottage industries, distribution, consumption, savings and investments.

- UNIT-IV**
1. Tribal Health and Medicine.
  2. Impact of Industrialization and Urbanization, Displacement of tribals as a result of land acquisition of projects and their rehabilitation.
  3. Tribal Unrest and revolts, Religious Movements, Political movements.
  4. Basic Issues in Transition, Loss of languages and Traditions, Identity crisis and Problems of integration.

**UNIT-V** Planning and development: Scheduled Tribes in Five Year Plans, Tribal development through SMPT Block, TD Block, Voluntary efforts and role of tribal leadership poverty alleviation programmes, Primitive Groups.

**Recommended Readings:**

1. Bhanage, N. P. Tribal Commissions and committees in India.
2. Chaudhury, Bhudadeb (Ed). Tribal Development in India
3. Elwin, V. A Philosophy for NEFA.
4. Haimendorf . The Tribes of India: Struggle for survival.
5. Shara B. D. Basic issues in Tribal Development.
6. Singh, K.S. Tribal Movements in India. Vols. I & II.
7. Singh, K. S. (Ed). Tribal situation in India.
8. A. R. N. Sivastav & A. K. Sinha. 1990. Vavharik Manavvigan aur Janjatiya Kalyan (in Hindi) Samajik Manav Vighyan Prakashan, Allahabad. Vishvavidhyala.
9. A. R. N. Shrivastav . Janjatiya Bharat (in Hindi), Madhya Pradesh Hindi Granth Academy, Bhopal.
10. Nadeem Hasnain. Janjatiya Bharat (in Hindi), Jawahar Publishers and Distributors, New Delhi.
11. V. S. Upadhayay & Gaya Pandey. Janjatiya Vikas (in Hindi), Madhya Pradesh Hindi Granth Academy, Bhopal.
12. Budhadeb Choudhuri (Ed). Tribal Transformation in India.
13. Gisbert P. 1978. Tribal India: A synthetic view of " Primitive Man", Rawat Publications,
14. Surjit Sinha & Sharma, B. D. (Ed.) : Primitive Tribes : The First Step, Govt. of India, Ministry of Home Affairs, New Delhi.
15. L. P. Vidyarthi (Ed.). Applied Anthropology in India.
16. Brahamdev Sharma. Adivasi Swasatha (in Hindi).
17. Vidyarthi, L. P. & B. K. Rai. The Tribal Culture of India, Concept Publishing Co., New Delhi.
18. Rao, P. V. Tribal Development: Policy and Practice, Sarup & Sons, New Delhi.

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19. Behera, D.K. and George pfeffer. Contemporary Society Tribal Studies, Volume I to V New Delhi: Concept Publishing Company.
20. George pfeffer. Hunters, Tribes and Peasants: Cultural Crisis and Compariso Bhubaneswar: Niswas
21. Vidyarthi, L.P. and Rai, Applied Anthropology in India
22. Vidyarthi, L.P. and B.N. Sahay. Applied Anthropology and Development in India. New De National Publishing House
23. A.K. Pandey. Tribal Situation in India. New Delhi: Manak
24. Vidyut Joshi. Tribal Situation in India: New Delhi: Rawat
25. A.K. Singh. Tribal Development in India. New Delhi: Classical Publishing Company
26. Hassnain, Nadim. Tribal India

The primary data of M.A./M.Sc. dissertation need to come invariably from communi studies. It needs to be supplemented by secondary data and library as such. Unlike field w training, the data has to be collected by single student. The dissertation has to be in the form of such design which will include hypothesis and/or research questions and a conceptual mode

**The completed dissertation should provide proof of student's understanding of:**

- a. Research design as applicable to a specific topic.
- b. Issues concerning sampling, quantitative and qualitative analysis of data.
- c. Linkage of theory and data in regard to certain specific issues such as gend rehabilitation, development and backwardness.

**RECOMMENDED READINGS:**

1. Pelto P.S. & Pelto Anthropological Research, Cambridge University Press, London
2. Goode & Hatt Methods in Social Research
3. Young, PaulineScientific Social surveys and Research.
4. H. Russel, Bernard Hand book of Methods in Cultural Anthropology.