MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER

पाठ्यक्रम
SYLLABUS

SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF SCIENCE

M.Phil. Mathematics
M.Phil Examination Semester-I, Semester-II

२०१०−११ से प्रभावी(w.e.f.)

सत्र २०१३−१४

महर्षि दयानन्द सरस्वती विश्वविद्यालय, अजमेर

NOTICE

1' Change in Statutes/Ordinances/Rules/Regulations/ Syllabus and Books may, from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any change that applies to years he has not completed at the time of change. **The decision taken by the Academic Council shall be final.**

सूचना

1. समय-समय पर संशोधन या पुन: निर्माण कर परिनियमों /अध्यादेशों / नियमों / विनियमों / पाठ्यक्रमों व् पुस्तकों में परिवर्तन किया जा सकता है, तथा किसी भी परिवर्तन को छात्र को मानना होगा बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से उनको छूट न दी हो और छात्र ने उस परिवर्तन के पूर्व वर्ष पाठ्यक्रम को पूरा न किया हो। **विद्या परिषद द्वारा लिये गये निर्णय अन्तिम होंगे।**

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MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER
Ordinance 123 (V) relating to M. Phil Examination
According to Minimum standards and procedure for awards of
M. Phil degree as per the guidelines of U.G.C. Regulation, 2009
Scheme of Examination

1. For starting or continuing M. Phil course in the University and its affiliated colleges, it must be ensured that at least two qualified teachers are available in that subject. A teacher who possesses Ph.D. Degree shall be eligible to teach M. Phil classes. A teacher who possesses Ph.D. Degree and three years P.G. teaching experience shall be eligible to supervise M. Phil dissertation.

2. A candidate for admission to the courses of study for the Degree of M.Phil must have obtained a Master's Degree in the concerned subject with at least 55% marks at the post graduate Examination of this University or of any other University/ Institution . A candidate with second division at post graduate examination (with less than 55% marks) shall be eligible for the M.Phil. if he/she has second division at the graduate examination. Relaxation in the eligibility will be given to SC/ST/OBC/PH etc as per rules of the University/State Government.

3. **Admission to M. Phil Programme**
   (i) University shall issue notification regarding Eligibility test for admission to M.Phil Programme. Research Eligibility Test (RET- M.Phil) in the National/Regional news papers etc.
   (ii) University shall conduct RET-M.Phil on the date notified once every year.
   (iii) Candidates who have qualified the UGC/CSIR(JRF)/NET/SET/ GATE/ or any equivalent examination conducted by the State/Central government/Teacher Fellowship holder are exempted from RET.
   (iv) The University shall prepare a merit list of the eligible candidates.

4. **Procedure for Admission to M.Phil Programme**
   A merit list shall be prepared of the eligible candidates based on the weightage of percentage of the academic record such as Sr. Secondary, Graduation, Post Graduation, publication in the peer reviewed journal, presentation of paper in National/International Conference/Seminar/ Workshop shall be as follows:

1.	Sr. Secondary	10% of the percentage obtained
2.	Graduation	20% of the percentage obtained
3.	Post graduation	60% of the percentage obtained
4.	Publication	05*
5.	Conference/seminar	05**

   (*2.5 marks for each publication with maximum 5 Marks,
   ** 2.5 marks for each conference/seminar with maximum 5 marks)
   The number of candidates called for interview shall be twice the availability of seats. Allocation for the candidates for the University and colleges shall be faculty wise and centralized at the University campus.

5. **Students allotment Committee**
   The Composition of the Committee shall be as follows:
   (i) Dean P.G.Studies
   (ii) Dean Concerning Faculty
   (iii) Head of the Deparment/Incharge/Director of the concerning teaching Department of the University/College
   (iv) Principal or his/her nominee (in the case of College)

(v)   Director Research (Member Secretary)

6.   Research Eligibility Test (RET-M.Phil)

A. Procedure

There shall be a Research Eligibility Test for M.Phil. of 200 marks comprising of two papers of 100 marks of two hours duration each. Both the papers will be held on the same day with a gap of one hour. A candidate who does not appear in paper I shall not be allowed to appear in paper II. First paper shall be of Research aptitude and the second paper shall be subject paper based on the concerned subject.

B. Syllabus

Syllabus of paper First shall be based on research aptitude and the Second paper shall be based on the common papers of syllabus of M.D.S. University, Ajmer of their post graduation of the concerned subject. (Except special/optional papers)

Paper I – Research Aptitude

The questions shall be of general nature, intended to assess the research aptitude of the candidate. It will primarily be designed to test reasoning ability, comprehension, divergent thinking, computer skills, elementary statistical methods and general awareness of the candidate. A total of 50 multiple choice questions (MCQ's) will be set. Each question shall carry 2 marks. There will be no negative marking.

Paper II – Subject Paper

There shall be only one subject paper based on the syllabus of the common papers candidate has studied at the post graduation. There will be three sections in this paper.

Section A: 20 question of multiple choice 2 marks each = 40
Section B: 10 question of short answers 3 marks each = 30
Section C: 2 question of long answers 15 marks each = 30

(All Question in Section A and B shall be compulsory. In section C there will be four questions out of which candidate shall be required to attempt any two questions.)

7.   The candidate after getting admission in the M.Phil. programme will carry out the M.Phil. studies as per the scheme mentioned below.

Semester Scheme for M.Phil Courses

(i)   M.Phil. course shall be of one academic session to be run under semester scheme and credit system. There will be two semesters in the academic session. Each semester will be of about 20 weeks duration having a minimum of 90 days (16 weeks) of actual teaching, one week for preparatory leave and remaining days for the conduction of examination and other activities.

The tentative schedule is as below:
First semester :   July to November
Internship: >2 weeks (December)
Second semester: January to May

(ii)   There will be six (6) theory papers in one academic session divided equally into two semesters. The dissertation is in lieu of IV and VIII theory papers in Semester I and II, respectively.

(iii)   The M.Phil. Course shall be of 32 credit hours, i.e. 16 credits per semester.

(iv)   Each theory credit hour shall be designated as 1L that shall be equal to 1 hour of instruction and one dissertation credit hour shall be designated as 1 D credit that shall be equal to 1.5 hour per week. (L = Lecture; D=Dissertation)

(v)   Each theory paper shall be of 4L credits per semester with total 64 hrs of instructions. The semester shall be of about 16 weeks, 4 hrs instructions shall be given to each theory paper per week.

(vi)   The dissertation shall carry 4 D in each semester with total 96 hours of instruction hours per semester. Since a semester shall be of about 16 weeks, 6 hrs instruction per week shall be given to dissertation.

(vii)   Each theory paper shall be of 50 marks and dissertation shall be of 50 marks. There shall be no evaluation of the dissertation at the end of first semester because the work carried out during the first semester shall be continued in the second semester. Evaluation of the dissertation shall be done at the end of the second semester.

(viii)   The distribution of credits and the examination scheme are as below:

Paper	Title	Max. Marks	Credits	Minimum hours of instruction		Minimum hours of self study	
				Per week	Per semester	Per week	Per semester
Semester I							
I	Research	50	4	4	64	4	64
	Methodology						
II	Optional Paper	50	4	4	64	4	64
III	Optional Paper	50	4	4	64	4	64
IV	Dissertation*	—	4	6	96	12	192
Semester I Total		150	16	18	288	24	384
Semester II							
V	Advance	50	4	4	64	4	64
	Research						
	Methodology						
VI	Optional Paper	50	4	4	64	4	64
VII	Optional Paper	50	4	4	64	4	64
VIII	Dissertation*	100	4	6	96	12	192
Semester II Total		250	16	18	288	24	384
Grand total of Semester I & II		400	32		576		768

There will be internship of two to three weeks between two semesters
*Dissertation will begin from semester I and shall complete at the end of the second semester.

(ix) The total maximum marks for evaluation in M.Phil. shall be 400.

(x) The time allotted for self study is the minimum time expected to be spent on various activities like practical, field work, library reference work, use of computer and internet and such other facilities.

(xi) There shall be one paper-on Research Methodology (Paper-I) in Semester I and one on Advance Research Methodology in Semester II.

(xii) Papers II, III shall be optional paper in Semester I and paper VI and VII shall be optional in II Semester. *

(xiii) Out of a maximum of 50 marks in each theory paper 15 marks (30%) shall be for the continuous sessional assessment to be done internally based on assignments (5 marks), written test (5 marks) and seminar/group discussion (5 marks). The internal assessment marks should be sent to the University by the various Departments/Affiliated Colleges of the University before the commencement of theory examination. The theory examination will be held at the end of each semester. Each theory paper shall be assessed out of a maximum of 35 marks

(xiv) All paper setters and examiners for the external assessment shall be external persons (i.e. those who are not working either in the M.D.S University or in any of its affiliated colleges). The Board of studies shall prepare a separate panel of Examiners for M. Phil. theory papers as well as dissertation. Appointment of the paper setters and examiners shall be made on the recommendations of the committee for selection of the examiners.

(xv) The answer books of theory papers of external examination shall be evaluated by single examiner. After declaration of the result the student concerned if desires shall be entitled for re-evaluation in accordance with the provisions of the university. Dissertation shall be evaluated by two examiners.

(xvi) The student will have to carry out the work of dissertation in both the semesters and shall submit the thesis for evaluation within two weeks after the last theory examination of II Semester.

(xvii) Dissertation work shall be conducted by the candidate under the supervision of any teacher who is registered as M.Phil. Supervisor with the teaching department concerned. An M.Phil. Supervisor can normally guide five dissertations at a time. However, the maximum limit may be relaxed by the Vice-chancellor on the recommendation of the Head. The work load for dissertation shall be six hours per week per class.

(xviii) For dissertation work the placement of every candidate under a supervisor shall be decided within one month from the last date of admission.

(xix) The dissertation will be divided into two parts. Part I of Semester I will constitute preparation of plan of work that should be presented by the student in front of the faculty of the department, who will assess the feasibility and recommend

suggestions, if any, for the improvement. The student must suitably incorporate the changes, if any, in the synopsis in consultation with the supervisor. Following this he/she must write and submit type written draft of chapters on review of literature and methodology to the supervisor. He/she may also conduct some preliminary work/experiments to understand the techniques. The supervisor shall submit a report of satisfactory progress to the Head of the Department before beginning of the theory examination. The latter shall forward it to the university along with marks for internal assessment. The dissertation shall be of 100 marks to be evaluated out of 70 marks by an external examiner. The marks obtained, shall be added to the marks obtained in the viva voce examination to be held subsequently.

(xx) In the second part of dissertation in Semester II, the student will have to complete the work as per the aims and objectives of the study and submit a dissertation. Prior to final submission of the dissertation, the student shall make a pre- M. Phil. presentation in the department in the presence of all the faculty chaired by the Head of the Department . Suggestions, if any, may be suitably incorporated into the dissertation.

(xxi) The candidate must give a certificate that (1) the dissertation incorporates his/her own work, (2) the work incorporated in the dissertation is not a repetition of earlier work, (3) any part of the dissertation containing information from other sources has been properly cited or has been printed after having obtained due permission from the original author, and (4) any kind of assistance or help taken during the course of work has been properly acknowledged. This certificate must be attached immediately after the title page of the dissertation. Supervisor shall give a certificate according to the prescribed format ((Annexure-I)

(xxii) The dissertation must be hard bound and type written dissertation on A-4 size paper. Four hard copies and four soft copies in non-editable PDF format must be submitted to the Head of the Department through the Supervisor. The colour of the cover page of dissertation shall be faculty wise (Annexure-II).

(xxiii) On receipt of satisfactory evaluation report of dissertation, i.e., minimum 50% marks M. Phil. students shall undergo a viva voce examination of 30 marks which shall also be openly defended. There will be an examination committee comprising one external examiner and one internal examiner, the later may be the supervisor of the candidate or the Head of the Department in the absence of the supervisor.

(xxiv) Every student shall be required to undertake a compulsory internship of 2-3 weeks in between the two semesters. The internship schedule shall be decided by the concerning Head of the Department. The teaching institution may decide for the provision of stipend for the students taking internship. The students will be required to submit and present a report of the internship. The participating organization/institution will give the performance appraisal of the student's work. The concerning supervisor of the Department shall certify the satisfactory

performance of the students during internship and submit the same to the examination section through the Head of the Department of the university.

(xxv) Every candidate shall be required to attend a minimum of 75% of the lectures, tutorials, seminars and practical (taken together) held in each paper.

(xxvi) Every student of semester I shall be promoted to the next semester at her/his own risk in case he/she qualifies in 50% of papers (2 theory papers of semester I).

(xxvii) The student who fails in any paper of Semester Ist or IInd shall appear in the due paper in the next year along with the concerned Semester.

(xxviii) The award list should show both, total marks of the continuous internal assessment as well as external assessment in the theory papers separately and the third column must have the aggregate marks of the two. The candidate will be considered pass on the basis of the combined total marks secured in each paper.

(8) For a pass, a student will have to obtain (a) at least 40% marks in each paper separately and (b) a minimum of 50% marks in the aggregate of all the papers prescribed for the examination. In the marksheet, successful candidates shall be classified as under:

Pass	50% or more but less than 55% marks in the aggregate
Second Division	55% or more but less than 65% marks in the aggregate
First Division	65% or more but less than 75% marks in the aggregate
First Division with Distinction	75% or more marks in the aggregate

A candidate who fails at the examination even in one paper/dissertation shall be required to reappear at the examination in a subsequent year in all the papers/ dissertation prescribed for the examination, provided that a candidate who obtains at least 50% marks in dissertation shall be exempted from submitting a fresh dissertation and the marks obtained by him shall be carried forward for working out his result.

9. **Depository with UGC**

(i) Following the successful completion of the evaluation process and announcements of the award of M.Phil the University shall submit a soft copy of the M.Phil dissertation obtained from the candidate to the UGC, for hosting the same in INFLIBNET accessible to all Institution/Universities.

(ii) Along with the Degree, the University, shall issue a Provisional Certificate certifying to the effect that the Degree has been awarded in accordance with the provisions to these Regulations of the UGC.

M.Phil EXAMINATIONS
MATHEMATICS
SEMESTER–I

SCHEME OF EXAMINATION

Distribution of marks for each paper is as mentioned below:

(i)	University written examination	35 marks
(ii)	Internal assessment	15 marks
	(a) Assignments	5 marks
	(b) Written Test	5 marks
	(c) Seminar presentation/Group discussion	5 marks

Note : There will be one compulsory paper of Dissertation carrying 100 marks.

Dissertation : One Dissertation based on any one of the optional paper offered. The student will have to carryout the work of dissertation in both the semesters and shall submit the dissertation for evaluation within two weeks after the last theory examination of II semester.

(A) Compulsory

Paper		Teaching Hrs per Week	Examination Duration (Hrs.)	Max. Marks External + Internal
I	Research Methodology	4	3	35 + 15 = 50
(B)	**Optional**			
II	H –functions	4	3	35 + 15 = 50
III	Differential forms in General Relativity	4	3	35 + 15 = 50
IV	Dissertation	6	-	-
	Total Marks			150

There will be internship of two to three weeks between two semesters.

SEMESTER–I
PAPER I - Research Methodology

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

Review of the Basic Statistics

Probability distribution, Normal Distribution, Test of Significance (t, F, X^2, Z), Analysis of variance, Sampling, estimation.

Mathematical Type setting in Equation Editor

Expression, Equation, Matrices Numerical Formulas, Solution of algebraic equation and differential Equations by using matrix operator theory.

Various types of integral & differential operators and their applications in different disciplines.

Geometric properties of generalized functions.

Linear and Non Linear Programming Problems.

Special Function and Generalized Special Function, Generating Function.

Fundamental Tensor, Tensor, Geodesics, Bianchi Identities, Flat Space, Einstein Tensor.

Basic elements of a mathematical Research Paper.

Power Point Presentation of a Research Method/Research Work/Research Paper.

Book Recommended:

1. Mathematical Theory of Statistics, Kapur & Saxena
2. Mathematical Statistics Vol. 1 & 2, W. Feller

SEMESTER–I
PAPER II, H - Functions

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

H – function of one and two variables:

Definition, Elementary Properties, Special Cases. Asymptotic expansion of the H-function. Simple Transformation formulas, Differentiation formulas, Summation formulas. Simple Finite and Infinite Integrals involving H- functions. Mellin and Laplace Transform of the H – function.

Book Recommended:

1. The H-function of one and two variables with application : Srivastava, Gupta & Goyal, South Asian Publishers, Chennai
2. The H-function with applications in statistics and others disciplines: Mathai and Saxena, John Wiley & Sons, New York.
3. Generalised hyper geometric functions with Applications in Statistics: other disciplines Mathai and Saxena, Spring Verlag, New York (1973).

SEMESTER–I
PAPER III - DIFFERENTIAL FORMS IN GENERAL RELATIVITY

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

Lie derivatives, Symmetry and killings equations. Spherical, symmetric and plane symmetric space – time. Differential Forms: basic ideas, Definition, Wedge Product, Exterior Differential, Coordinate Differentials, Integral Theorems. Riemannian Geometry: Basic – I forms, Connection – 1 form, Coordinate frame, equation of structure, curvature – 2 forms. Identities for curvature, Vaidya metric.

Book Recommended:

1. Differential forms in general relativity : Dublin : W. Isreal.
2. Differential forms with applications to the physical sciences : H. Flanders.

SEMESTER–II

SCHEME OF EXAMINATION

Distribution of marks for each paper is as mentioned below:

(i)	University written examination	35 marks
(ii)	Internal assessment	15 marks
	(a) Assignments	5 marks
	(b) Written Test	5 marks
	(c) Seminar presentation/Group discussion	5 marks

Note : There will be one compulsory paper of Dissertation carrying 100 marks.

Dissertation : The student shall submit the dissertation for evaluation to the concerning HOD/Principal of the college with in two weeks after the last theory examination of II Semester.

(A)   Compulsory

Paper		Teaching Hrs per Week	Examination Duration (Hrs.)	Max. Marks External + Internal
V	Advanced Research Methodology	4	3	35 + 15 = 50
(B)	**Optional**			
VI	Fractional Calculus and Univalent Functions	4	3	35 + 15 = 50
VII	Cosmology	4	3	35 + 15 = 50
VIII	Dissertation	6	70 + 30(Viva Voice)=100	
	Total Marks			250
	Grand total of Semester I & II			400

PAPER V - Advanced Research Methodology

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

Data Representation:

Different types of data representation in Tabular form in MS-Word.

Different type of chart, graphs in MS-Excel.

Mathematical Techniques through Software's:

Use of Mathematical/Statistical Function in Excel.

Inverse of a matrix, Eigen Value and Eigen vector of a matrix, solution of a equation method of numerical analysis by using Sci lab.

Solution of Linear programming problem and integer programming problem by using Tora.

Mathematical Research Paper in Latex:

Basic code for Title

Basic code for Abstract

Basic code for introduction

Basic code for Mathematical part

Basic code for insert a graph/picture

Basic code for bibliography/Reference

Book Recommended:

1. · LaTex Double Dot a Documentation Preparation, Leslie, Lampart, PSN Education Publishers.

PAPER VI - Fractional Calculus and Univalent Functions

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

Fractional Calculus:

    Historical Survey and Modern Approach. Riemann – Liouville fractional integrals and derivative. Definitions and some examples. Law of exponents, Leibniz's formula for fraction derivatives. Ordinary derivatives of fractional integrals. Laplace Transform.

    Weyl Fractional Calculus : Definition, Good function. Law of Exponent, Leibniz's Formula.

    Univalent functions: Introduction, The Area Theorem, Growth and Distortion Theorems, Coefficient estimates, convex and Starlik functions.

Book Recommended:

1. An introduction to the fractional calculus and fractional differential equations: Miller and Ross. John Wiley & Sons Inc., New York.
2. The fractional Calculus: K. B. Oldhams and Spanier Academic Press, New York.
3. Fractional Integrals and Derivatives theory and applications Samelo, Kilbas and Mariche, Gorden and Brach Science Publishers.
4. Univalent Functions: Duren, P.L. Springer verlog, New york.

PAPER VII - COSMOLOGY

Duration : 3 Hrs   **Max. Marks : 35**

Note : Candidates will be required to attempt any four out of seven questions:

    Non-Static Cosmological models. Cosmological Principles, Einstein field equations in cosmology-energy-momentum. Tensor of the universe. Hubble's law Weyl's Hypothesis. Robertson – Walker metric. Doppler effect in Robertson-Walker metric. Fried Mann-Robertson – Walker (FRW) model. Horizons in FRW model. Alternative cosmologies: Mach's Principle, Brans-Dicke Theory of Gravity. Cosmological Solutions in Brans-Dicke Theory, Singularities.

Book Recommended:

1. General Relativity and Cosmology: the Macmillan Co. of India Ltd. : J. V. Narlikar.
2. Introduction to Cosmology : Cambridge Univ. Press. J. V. Narlikar.
3. Introduction to General Relativity : MCGraw Hill Inc. : R. Adler, M. Bazin, M. Schiffer.
4. Theoretical Cosmology : Clavendon Press, Oxford : A. K. Raychaudhuri
5. Gravitation : W. H. Freeman & Co. Sanfrancisco : C. W. Misnev, K.S. Thorne, J. A. Wheeler