Meeting of the Board of Studies in Mathematics (PG)

Minutes of the meeting of PG Board of Studies in Mathematics which is held on Saturday, 6th January 2018 at 12.45 p.m., in Board Room (APRC) at Sacred Heart College, Tirupattur.

AGENDA: To review and approve syllabi for M.Phil Mathematics which is to be implemented from the academic year 2018 – 19.

CHAIR PERSON: **Dr. A. George Maria Selvam**

Head (PG) and Associate Professor,
PG and Research Department of Mathematics
Sacred Heart College (Autonomous)
Tirupattur, Vellore Dist. 635 601.

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Prof. P. Manoharan

Prof. S. Kalaiarasi

Dr. A. Merceline Anita

Dr. V. Balaji

Prof. M. Antony Arockiasamy

Dr. D. Ajay

Dr. N. Nithya Priya

Prof. S.U.Vasantha Kumar

Prof. S. Savitha

Prof. B. Govindan

Dr. B. Chandra Sekar

Prof. S. Pallavi

Prof. T.G. Gerly

Prof. M. Meganathan

Prof. D. Vignesh

Student Members

| Silviya F | DR150202 |
| Antony Raj A | DR170203 |

PG Chairman and Head Dr. A.George Maria Selvam presented to the board the newly framed MPhil syllabi. The following suggestions were made by the board:

Suggestions:

1. Dissertation manual to be prepared.
2. Reviews may be considered for dissertation evaluation.

Resolutions:

It is resolved to approve

i) the following M.Phil syllabi.

ii) the evaluation pattern for theory (CA and Semester) and dissertation.

STRUCTURE

The structure of the M. Phil Curriculum is as follows

Paper I	**Analysis and Differential Equations**
Paper II	**Algebra and Topology**
Paper III	**Research Specific Paper (offered by the supervisors)**
Paper IV	**Dissertation**

SYLLABI

Paper I - Analysis and Differential Equations

Semester: I   **Code: MAR**

Credits:

Objective: To impart the research level knowledge of the concept of the L^p- space and Banach algebra of L^1. To solve the system of differential equations and study the stability properties of dynamical systems.

UNIT - I : Abstract Integration

The concept of measurability – simple functions – elementary properties of measure – arithmetic in $[0, \infty)$ – integration of positive functions – integration of complex functions – the role played by sets of measure zero. L^p- space Convex functions and inequalities – the L^p- space – Approximations by continuous functions.

Text Book 1 : Chapter 1, pp. 5-32; Chapter 3, pp. 61-75.

UNIT - II : Fourier Transforms

Formal properties – the inversion theorem – the Plancherel theorem – the Banach algebra of L^1.

Text Book 1 : Chapter 9, pp. 178-195.

UNIT - III : Holomorphic Fourier Transforms

Introduction – two theorems of Paley and Weiner – quasi analytic classes – the Denjoy- Carleman theorem.

Text Book 1: Chapter 19, pp 371-385.

UNIT - IV : Linear Systems

Uncoupled linear systems – diagonalization – exponentials of operators – the fundamental theorem of linear systems – linear systems in R^2 – non homogeneous linear systems.

Text Book 2 : Chapter 1, Sections 1.1 to 1.5 and 1.10

UNIT – V : Non-linear systems:

Local Theory: Some preliminary concepts and definitions – the fundamental existence uniqueness theorem – dependence on initial condition and parameters – the maximal interval of existence – the flow defined by a differential equation – Linearization - the stable manifold theorem.
Global Theory: Dynamical systems and global existence theorems.

Text Book 2: Chapter 2&3, Sections 2.1 to 2.7 & 3.1

Content and Treatment as in:

Text Books:

1. **Walter Rudin,** Real & Complex Analysis, 3/e McGraw- Hill book company, New Delhi 1987.

2. **Lawrence Perko,** Differential Equations & Dynamical Systems, 3/e, Springer Verlag, New York Inc., 2001.

Books for Reference:

1. Richard R. Goldberg, *Methods of Real Analysis*, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 1970.

2. Robert G. Bartle and Donald R. Sherbert, *Introduction to Real Analysis*, 2-e, John Wiley and Sons, 2000.

3. Kathleen T. Alligood, Tim D. Sauer, James A. Yorke, CHAOS, *An Introduction to Dynamical Systems*, Springer-Verlag, New York, Inc, 1996.

4. Morris W. Hirsch, Stephen Smale, Robert L. Devaney, *Differential Equations, Dynamical Systems, And An Introduction To Chaos*, Academic Press, USA, 2004.

Learning Outcomes:

Upon completing the course, students are able to

> Produce rigorous proofs of results that arise in the context of L^p – spaces, L^p- space Convex functions and inequalities, Approximations by continuous functions, Fourier Transforms and Holomorphic Fourier Transforms.

> Prove a selection of theorems concerning Denjoy-Carleman theorem, Paley and Weiner theorem, the inversion theorem, the Plancherel theorem.

> Solve system of differential equations of first order using Phase portraits and methods of Linear Algebra.

> Solve and apply stability properties of non linear differential equations.

Paper II - Algebra and Topology

Semester: I   **Code: MAR**

Credits:

Objective: To impart the nuances of the research level knowledge of the concept of Rings and Ideals, Modules, Modules of Fractions, Primary decomposition, Noetherian and Artin Rings. To become familiar with Homotopy, Covering spaces, Geometry of simplicial complexes and Bary Centric Subdivisions.

Unit – I: Ring & Modules

Rings and Ideals; Modules.

Text Book – 1: Chapters 1 and 2

Unit – II: Primary Decomposition

Rings and Modules of Fractions; Primary decompositions.

Text Book – 1: Chapters 3 and 4

Unit – III: Noetherian & Artin Rings

Chain Conditions; Noetherian Rings; Artin Rings.

Text Book – 1: Chapters 6, 7 and 8

Unit – IV: Fundamental Group & Covering spaces

Homotopy – Fundamental Group – Covering spaces.

Text Book – 2: Chapter 3: sections 3. 1 to 3.3

Unit – V: Simplicial Complexes

Geometry of Simplicial Complexes – Bary Centric Subdivisions – Simplicial Approximation Theorem.

Text Book – 2: Chapter 4: sections 4.1 to 4.3.

Content and Treatment as in:

Text Books:

1. **M.F. Atiyah, FRS, and I.G. Macdonald,** *Introduction to Commutative Algebra*, University of Oxford, Addison – Wesley Publishing Company, Inc, 1969.

2. **I.M. Singer and J.A. Thorpe,** *Lecture Notes on Elementary Topology and Geometry*, Springer Verlag, New York, 1967.

Books for Reference:

1. **D. M. Burton,** A First Course in Rings and Ideals, Addison-Wesley Publishing Company, London, 1970.

2. **James Dugundji,** Topology, Prentice Hall of India Pvt. Ltd. 1975.

3. **J.L. Kelly,** General Topology, Spinger Verlag, 1961.

4. **T.Y. Lam,** Lectures on Modules and Rings, Graduate Texts in Mathematics, Vol.189, Springer – Verlog, New York, 1999.

5. **N. H. McCoy,** The Theory of Rings, Chelsea Publishing Company, Bronx, New York, 1973.

6. **L.H. Rowen,** Ring Theory, Vol I, II, Academic Press, New York, 1988.

Learning Outcomes:

Upon completing the course students are able to

➤ understand and illustrate the concepts of Rings and Modules, Primary Decomposition, Noetherian and Artin Rings.

➤ understand and illustrate the concepts of algebraic topology.

Syllabus for *Paper III - Research Specific Paper* shall be framed by the supervisor and provided to the candidates under his supervision. The Syllabus shall contain five units with specific books for study.

EXAMINATION PATTERN

There shall be two components for Papers I and Paper II namely CA and Semester Examination. Total marks for each paper I and II shall be as follows.

CA   40 Marks

Semester Examination 60 Marks

The Components of CA and the distribution of marks shall be as follows.

There shall be two tests which carries 20 (10 + 10) marks. If any student is absent for valid reason during the test, a repeat CA may be conducted in consultation with the course Teachers.

The question paper shall contain two sections. Section A shall contain 4 **either or type** questions. Each question carries 5 marks. Section B shall contain four questions and the students are required to answer any three questions. Each question carries 10 marks. The duration of the examination shall be 2 hours.

There shall be two problem solving sessions which carry 10 marks. The third component of CA is seminar which carries 10 marks.

Guide paper (Paper III) has no internal components.

Question Paper Pattern for Papers I and II (Semester)

The question paper shall have two sections with the maximum of 60 marks for three hours with the following break-up.

Section-A

Section – A shall contain *five* "EITHER OR" type questions drawn from all the five units. (one "EITHER OR" type question from each unit).
Each question shall carry 6 marks. (5 x 6 = 30).
Either or Type. Answer all Questions.

Section-B

Section – B shall contain *five* questions drawn one each from the 5 units. Three questions out of 5 are to be answered. Each question shall carry ten marks. (3 × 10 = 30).

Answer any Three questions.

TITLE OF THE PAPER

Time: Three Hours   Maximum Marks: 60

Section – A (5 × 6 = 30 Marks)
Answer ALL Questions
(Two questions from each unit with internal choice)
Section – B (3 × 10 = 30 Marks)
Answer any THREE questions
(One question from each unit)

The question paper pattern for *Paper III* shall be according to the choice of the supervisor. The duration of the examination shall be 3 hours. The question paper shall be prepared for 100 marks and the answer scripts shall be valued for 100 marks.

The dissertation shall be subject to plagiarism check by the software provided by the College. Maximum of 40% similarity may be allowed for the dissertation excluding the first chapter (introduction, basic definitions, survey of literature, outline of the dissertation), chapter containing the published work by the scholar and bibliography (references). There shall be two reviews by the supervisor and two more staff suggested by the supervisor in the relevant field. Students shall make a presentation during the second review. M.Phil scholars shall present at least one research paper in a conference/seminar or publication in a UGC approved journal before the submission of the dissertation and

produce evidence for the same in the form of presentation certificates and/or reprints/acceptance by the journal.

The dissertation carries 100 marks for which the dissertation shall be evaluated for 80 marks and the Viva Voce carries 20 marks.

There shall be two valuations of the dissertation, one by the supervisor and the other by the external examiner who shall be one of the three examiners suggested by the department in consultation with the supervisors. The average of the two valuations shall be the marks for the evaluation of the dissertation.

The viva voce examination shall be conducted by the respective supervisor and one external member chosen from a panel of three members suggested by the department. The average of the two marks shall be the final.

The dissertation shall be submitted during the last week of July and viva be conducted in the month of August.

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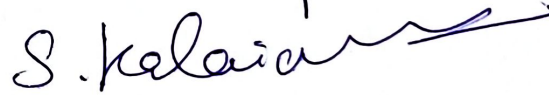
Alumnus

Internal Members:

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Prof. P. Manoharan

Prof. S. Kalaiarasi

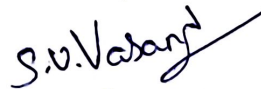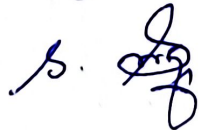Dr. A. Merceline Anita

Dr. V. Balaji

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Dr. N. Nithya Priya
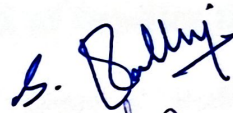
Prof. S.U. Vasantha Kumar

Prof.S. Savitha

Prof. B. Govindan

M.Phil Mathematics (06.01.2018)
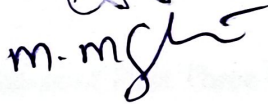
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Prof. S. Pallavi

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Prof. M. Meganathan

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Student Members

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Meeting of the Board of Studies in Mathematics (PG& M.Phil.,)

Minutes of the meeting of PG and M.Phil., Board of Studies in Mathematics which is held on Wednesday, 9th January 2019 at 12.30 PM in OASIS at Sacred Heart College (Autonomous), Tirupattur – 635 601, Vellore Dt.

AGENDA:

1. To review the present Syllabi of M.Sc Mathematics and Subjects offered to M.Com, MBA, MSc (CS), M.Sc., (ST) and MCA, Self Study Papers and Certificate Courses (First three semesters).
2. To review and approve the Research Specific Papers for M.Phil., Mathematics

Chair Person (PG): **Dr. A. George Maria Selvam**

Members

Dr. R. Murali

Dr. G. Britto Antony Xavier

Prof. S. Joseph

Dr. P. Manoharan

Dr. S. Kalaiarasi

Dr. A. Merceline Anita

Dr. V. Balaji

Dr. M. Antony Arockiasamy

Dr. D. Ajay

Dr. N. NithyaPriya

Dr. S.U. Vasantha Kumar

Mrs. S. Savitha

Dr. B. Govindan

Dr. B. Chandra Sekar

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Miss. D. Saraswathi

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Dr.R.Vijayaragavan   **Alumni**
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Thiruvalluvar University
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Mr.G. S. Krishnamuthy,   **Industrial Expert**
Group Manager, (Computer Aided Engineering)
Royal Enfield,
Chennai.

Discussion:

> External members appreciated Certificate Programmes R Language for Statistics and LaTex for Mathematics.

Members suggested:

> Change of titles for some Research Specific Papers.
> To replace some units found to be elementary with suitable content.
> To include few more reference Books.
> Improved syllabi for R Language for Statistics.
> To offer a Certificate programme on PYTHON.
> Diploma programme in Deep Learning and Machine Learning with R and Python
> Some modifications in Abstract Algebra, Real Analysis, Advanced Linear Algebra, Mathematical Analysis, Partial Differential Equations.
> Calculus of Variations and Integral Equations can be offered as a regular course (Not as an Elective).
> Skill Enhancement courses are repetitions of regular courses. Hence other Elective courses may be offered.

Resolution:

> Titles of some Research Specific Papers will be changed as per the suggestions given by members.
> Changes will be incorporated in the Research Specific Papers.
> Suitable Reference books will be included in the syllabi of Research Specific Papers.
> Modifications in PG syllabi will be implemented in the next revision.

Chair Person: **Dr. A. George Maria Selvam**
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Dr. A. George Maria Selvam
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