SYLLABUS (CBCS)
Of
Ph. D. in Mathematics & Computing

w. e. f. 2021-22

DEPARTMENT OF MATHEMATICS

RAJIV GANDHI UNIVERSITY
(A Central University)
RONO HILLS, DOIMUKH,
ARUNACHAL PRADESH

Programme Specific Outcomes (PSO)

To prepare and motivate graduates towards research activities to work in frontline areas of pure and applied mathematics and to enhance basic skills needed for life-long learning and professional development

STRUCTURE OF THE SYLLABUS (CBCS) FOR Ph. D. PROGRAMME IN MATHEMATICS

<table>
<tr><th rowspan="2">Semester</th><th rowspan="2">Paper Code</th><th rowspan="2">Title</th><th rowspan="2">Credits</th><th colspan="3">Marks Distribution</th></tr>
<tr><th>End Semester</th><th>Internal Assessment</th><th>Total Marks</th></tr>
<tr><td rowspan="15">Semester-I</td><td>MTH–711(C)</td><td>Research Methodology</td><td>04
(L-4, T-0, P-0)</td><td>80</td><td>20</td><td>100</td></tr>
<tr><td>MTH-712(C)</td><td>Research and Publication Ethics</td><td>02
(L-1, T-0, P-1)</td><td>25</td><td>25</td><td>50</td></tr>
<tr><td>MTH–72X(O)
(Open Choice)</td><td>Elective-I</td><td>02
(L-1, T-0, P-1)</td><td>40</td><td>10</td><td>50</td></tr>
<tr><td>MTH-73Y(E)</td><td>Elective Paper-II</td><td>04
(L-4, T-0, P-0)</td><td>80</td><td>20</td><td>100</td></tr>
<tr><td>MTH-700</td><td colspan="4">Thesis</td></tr>
<tr><td colspan="6">• MTH-711(C) and MTH-712(C) are compulsory papers.
• Students have to choose one paper for Elective –I either from MTH-721(O) & MTH-722(O) or any open choice paper of equal credits offered by the departments.
• Students have to choose one paper for Elective Paper-II among the optional papers MTH-731(E) to MTH-738(E)</td></tr>
<tr><td></td><td colspan="4">Elective-I (Open Choice)</td></tr>
<tr><td>MTH-721(O)</td><td></td><td colspan="3">Computer Applications</td></tr>
<tr><td>MTH-722(O)</td><td></td><td colspan="3">Problem Solving With C Programming</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td></td><td colspan="4">Elective-II</td></tr>
<tr><td>MTH –731(E)</td><td></td><td colspan="3">Advanced Analysis</td></tr>
<tr><td>MTH –732(E)</td><td></td><td colspan="3">Functional Analysis</td></tr>
<tr><td>MTH –733(E)</td><td></td><td colspan="3">Approximation Theory</td></tr>
<tr><td>MTH –734(E)</td><td></td><td colspan="3">Advanced Fluid Dynamics</td></tr>
<tr><td>MTH –735(E)</td><td></td><td colspan="3">Algebra</td></tr>
<tr><td>MTH –736(E)</td><td></td><td colspan="3">Partition Theory and Special Functions</td></tr>
<tr><td>MTH-737(E)</td><td></td><td colspan="3">Fuzzy Sets and Fuzzy Logics</td></tr>
<tr><td>MTH-738(E)</td><td></td><td colspan="3">Research in Mathematical Education</td></tr>
</table>

Abbreviations: L-Lecture, T-Tutorial, P-Practical

SEMESTER-I

MTH- 711(C)
(RESEARCH METHODOLOGY)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**:** 20
Contact hour per week	**:** 04
Credits	**:** 04 (L-4, T-0, P-0)
Terminal Examination duration	**:** 3 hours

Course Outcome: The paper equips students with the basics of the research. It equips students with concept of formulating research aim and objectives in an appropriate manner are one of the most important aspects and give the overall direction of the research.

Unit	Contents
I	**Importance of Scientific Research:** Philosophy and History of Mathematics, Formulation of Research Problem, Significance of Hypothesis and null Hypothesis, Formulation of Objectives, Quantitative & Qualitative Research, Research Tools–Online and Open Access Journals. Primary and Secondary Sources, Web sources, Critical Literature Review.
II	**Importance of Literature Review:** Structure and Components of Scientific and Technical Report writings, Survey of a Research Topic, Needs of Citations in Literature Reviews, Uses of Pictures and Graphs in Texts, Bibliography, Citation and Acknowledgement in a Research Paper, Survey A rticle and Thesis Writing.
III	**Importance of Reviewing a paper:** Role of a Supervisor, Publishing a Research Article, Research Article-Review, Funding Agencies, Writing of Research proposal for financial grant, Similarity in Research Articles, Copyright Issues of Publishing Houses, Necessity of Account in ORCID, Google Scholar, Research Gate, Scopus and Web of Science.
IV	**Research Paper Writing:** Preparation of a research paper for publication-Title, Abstract, Importance of Keywords and AMS subject classifications, Results, Findings & Discussions. Conference presentation.

References

1. Nicholas J. Higham, Handbook of Writing for the Mathematical Sciences, SIAM, 1998.
2. Donald E. Knuth, Tracy Larrabee &Paul M. Roberts, Mathematical Writing, Mathematical Association of America, 1989.
3. Leslie Lamport, LaTeX, a Document Preparation System, Pearson, 2008.
4. Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle &Chris
5. Rowley, The LaTeX Companion, Pearson, 2004.
6. Norman E. Steenrod, Paul R. Halmos, Menahem M. Schiffer &Jean A. Dieudonne, How to Write Mathematics, American Mathematical Society, 1973.
7. Mathtools documentation (http://mirrors.ctan.org/macros/latex/contrib/mathtools/mathtools.pdf)
8. Pstricks documentation (http://tug.org/PSTricks/main.cgi?file=doc/docs)
9. Nicholas J. Higham: Handbook of Writing for the Mathematical Sciences, Second Edition, SIAM Publisher (1998).
10. Robert K, Yin: Case Study Research: Design and Methods, Sage Publications Ltd., London
11. Leslie C. Prerelman: The Mayfield Technical Scientific Writing, Tata James parade &McGraw Hills (2001).
12. Kothari, C.R. Research Methodology, New Age International Pvt. Ltd. Pub, 2004

SEMESTER-I

MTH- 712(C)

(RESEARCH & PUBLICATION ETHICS)

(L-1, T-0, P-1)

Maximum marks	**:** 50 (Pass Mark: 55%)
End Semester	**:** 25
Internal Assessment	**:** 25
Contact hour per week	**:** (1+2)
Credits	**:** 02
Terminal Examination duration	**:** 2 hours

Course Outcome: To make students aware with research ethics and publication misconducts.

Unit	Contents
I	**Philosophy and Ethics** (3 Hrs)**:** Introduction to philosophy: definition, nature and scope, concept, branches - Ethics: definition, moral philosophy, nature of moral judgments and reactions.
II	**Scientific Conduct** (5 Hrs.): Ethics with respect to science and research - Intellectual honesty and research integrity Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) - Redundant Publications: duplicate and overlapping publications, salami slicing - Selective reporting and misrepresentation of data.
III	**Publication Ethics** (7 Hrs): Publication ethics: definition, introduction and importance - Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. - Conflicts of interest - Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types - Violation of publication ethics, authorship and contributor ship - Identification of publication misconduct, complaints and appeals - Predatory publisher and journals.
IV	**Open Acess Publishing** (4 Hrs.):Open access publications and initiatives - SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies - Software tool to identify predatory publications developed by SPPU - Journal finger / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc.
V	**Publication Misconduct** (4Hrs.): 1. Group Discussion (2 Hrs.): Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad. 2. Software tools (2 Hrs.): Use of plagiarism software like Turnitin, Urkund and other open source software tools.
VI	**Databases and Research Metrics (7Hrs.)** 1.Databases (4 Hrs): Indexing databases, Citation databases: Web of Science, Scopus, etc. 2.Research Metrics (3 Hrs.): Impact Factor of journal as per Journal Citations Report, SNIP, SJR, IPP, Cite Score - Metrics: h-index, g index, i10 Index, altmetrics.

Units I, II & III are to be covered via Theory mode and Units IV, V & VI are to be covered via Practice mode.

References

1. Bird, A (2006). Philosophy of Science, Routedge
2. Maclntyre, Alasdair (1967), A short History of Ethics, London
3. P. Chaddha (2018), Ethics in Competitive Research: Do not get scooped; do not get plagarised, ISBN: 9789387480865
4. Nationa Academy of Sciences, National Acadmy of Engineering and Institute of Medicine. (2009). On being a Scientist: A Guide to Responsible Conduct in Rsearch: Third Edition, National Academic Press.
5. Resnik, D. B. (2011): What is ethics in research & why is it important. National Institute of Environmental Helth Sciences, 1-10.
6. Becall, J. (2012), Predatory publishers are corrupting open access, Nature, 489(7415), 179-179.
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN 978-81-93948217

SEMESTER-I

(Elective Paper-I)

MTH- 721(O)

(COMPUTER APPLICATIONS)

(L-1, T-0, P-1)

Maximum marks	**:** 50 (Pass Mark: 55%)
End Semester	**:** 40
Internal Assessment	**:** 10
Contact hour per week	**:** (1+2)
Credits	**: 02**
Terminal Examination duration	**:** 2 hours

Course Outcome: The students are expected to be well equipped with fundamentals knowledge of computer programming and mathematical softwares for their research.

Unit	Contents
I	Fundamental of Computer, Operating systems, MS-Office, Networking.
II	Software: MATLAB , MATHEMATICA, and LaTeX

References

1. V. Rajarman: Fundamentals of Computing, PHI.
2. Jon Sticklen & M. Taner Eskil : An Introduction to Technical Problem Solving with MATAB v.7, 2e, 22006, Great lakes press.
3. Michel Trott: The Mathematical Guide Book for Programming, 2004, Spinger-Verlag.
4. Shubhi Lall: Computer Fundamentals and Introduction to IBM. PC, 2005, University Book House
5. Laslie Lamport: LaTeX: a document preparation system, User's guide and reference Manual, 2nd Edition, Addison Wesley, 1994.
6. F. Mittelbach: The LaTeX Companion, 2nd Edition, AddisonWesley, 2004
7. Stephen Wolfram: The Mathematica Book, Wolfram Media Inc; 5th edition (1 February 2004)

SEMESTER-I

(Elective Paper-I)

MTH- 722(O)

(PROBLEM SOLVING WITH C PROGRAMMING)

(L-1, T-0, P-1)

Maximum marks	**:** 50 (Pass Mark: 55%)
End Semester	**:** 40
Internal Assessment	**:** 10
Contact hour per week	**:** (1+2)
Credits	**: 02**
Terminal Examination duration	**:** 2hours

Course Outcome: The students are expected to be well equipped with fundamentals knowledge of computer programming and mathematical softwares for their research.

Unit	Contents
I	Problem Solving Techniques, Algorithm, Flow-chart, Decision Table, Basics of C in programming, Data type and variables, Identifier, Expression and operations.
II	Control statements: If-then-else, switch, Loops, Nested loops, Go to, break , continue statement, Arrays, functions, structure and union, and pointers.

References

1. V. Rajarman: Fundamentals of Computing, PHI.
2. Michel Trott: The Mathematical Guide Book for Programming, 2004, Spinger-Verlag.
3. P.Dey and M. Ghosh: Computer Fundamentals and Programming in C, 2007, Oxford University Press
4. Shubhi Lall: Computer Fundamentals and Introduction to IBM. PC, 2005, University Book House
5. E.Balagurusamy: Programming in ANSIC, Tata McGraw Hill, 2001.
6. B. S. Gottfried: Programming with C. McGraw Hill Education; Forth edition

SEMESTER-I
(Elective Paper-II)
MTH – 731(E)
(AVANCED ANALYSIS)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The students are expected to apply these concepts to study the topological properties of different spaces in their research work.

Unit	Contents
I	Nets and filters, their convergence, and interrelation. Hausdorffness and compactness in terms of net/filter convergence.
I	Tychonoffs theorem on the topological product of compact spaces. Local finiteness. Paracompactness- Normality of a paracompact space.
II	The L^p – space. Convex functions. Jensen's inequality. Holder and Murkowski inequalities. Completeness of L^p. Convergence in measure, almost uniform convergence.

References

1. James R Munkres:Topology, Pearson; 2nd edition (28 December 1999)
2. H.L. Royden: Real Analysis, Pearson Education India; 4th edition (1 January 2015)
3. T. M.Apostol: Mathematical Analysis. Narosa (1 January 2002)

SEMESTER-I
(Elective Paper-II)
MTH – 732(E)
(FUNCTIONAL ANALYSIS)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The students are expected to be acquainted research topics especially in-sequence space, operator theory, fixed point theory etc., and then this module will certainly guides the students of functional analysis.

Unit	Contents
I	Convergence of Cauchy nets in a Banach spaces, computation of conjugate spaces of continuous linear functional on certain Banach spaces, Weak and Weak* topologies on Banach spaces, the conjugate space of C([0,1]).
II	The Lebesgue space: L^1 and L^∞; The Dardy spaces: H^1 and H^∞.
III	The Banach algebra of continuous functions, Abstract Banach algebras, Abstract index in a Banach algebra, Gelfand- Mazur Theorem, Sectral radius formula, Stone Weierstrass theorem, The Disk algebra, Algebra of functions with absolutely convergent Fourier series.
IV	Weak and strong operator topology, W* algebras, Isomorphism of L^∞ spaces, Maximal abelian W* algebras, Homomorphism of C* algebras, Extended functional calculus, Fuglede Theorem.

References

1. R.G.Dougals: Banach Algebra Techniques in Operator Theory, Academic Press, 1971.
2. R.Larsen: Banach Algebras, Marcel Dekker Inc., New York, 1973.
3. B.V. Limaye: Functional Analysis, Wiley Eastern Limited, New Delhi, 1996.
4. Ervin Kreyszig: Introductory Functional Analysis with Applications John Wiley and Sons.

SEMESTER-I
(Elective Paper-II)
MTH – 733(E)
(APPROXIMATION THEORY)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The students are expected to understand and master theoretical issues that arise in approximation of functions by polynomials which will encourage research in the areas of approximation theory.

Unit	Contents	Marks
I	Linear operators, Examples – Bernstein Polynomials, Fourier series, Approximation theorem-Bohman and Korvokin's theorems, and its applications**.**	**15**
II	Exostejce pf polynomials of best approximation, characteristics of polynomial of best Approxination, Applications of convexity, Chebyshev system.	**20**
III	Apolication of some complex functions, Uniqueness of polynomials of Best Approximation, Chebyshev theorem, Chebyshev polynomial Interpolation, Algebraic polynomials, Trigonometric Polynomials.	**20**
IV	Least square approximation, Approxmation on an interval, Jacobi polymomials, Approcimation on a finite set of uniform approximation on a finite set of points.	**20**

References

1. G.G. Lorentz: Approximation of Functions; Holt, Tinehart and Wiston, Inc. 1966.
2. T.J. Rivlin: An introduction to the Approximation of Functions, Dover publications, 1981.
3. N. Hrushikesh, M. haskar and D.V.Pai: Fundamental of Approximation theory, Narosa Publishing House, 2000.
4. A. F. Timan: Theory of Functions Real Variable, New York, Macmillan, 1963.
5. G.Meinnardus: Approximation of Functions Theory and Nunerical Methods, Springer Verlag, Vol- 13, 1967.

SEMESTER-I
(Elective Paper-II)
MTH – 734(E)
(ADVANCED FLUID DYNAMICS)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: It is intended to acquainted with the advanced topics in fluid mechanics where the students will be able to apply the techniques used in deriving important results in research problems.

Unit	Contents
I	**Importance of Boundary Layers:** Prandtl's Boundary Layer Theory, Effects of Prandtl number in the momentum, Thermal and Concentration boundary layers, Concept of Kinematic and Dynamic Similarity, Dimensionless numbers and its significances, Viscous incompressible fluids, Newton's Law of Cooling, Momentum Boundary Layer Equations.
II	**Importance of Heat Transfer:** Concept and mode ofHeat Transfer, Fourier's Law, the Energy equation-conservation of energy, Analysis of flow distributions in (i) Couette flow, (ii) Plain Poiseuille flow, (iii) Hagen-Poiseuille flow, Free and Forced Convections, Calculation of Heat Transfer Coefficient.
III	**Importance of Mass Transfer:** Concept and mode ofMass transfer, Diffusion and Convection, Fick's law, Concentration Boundary Layer Equations, Calculation of Mass Transfer Coefficient. **Perturbation Method:** Concept of Infinite Series Solution Method or Classical Perturbation Technique,Solutions ofPartial differential equations, Stability and Convergence of the Scheme.

References

1. Schlichting, H., and K. Gersten. Boundary Layer Theory. Springer, 2000. ISBN: 9783540662709.
2. Panton, Ronald L. Incompressible Flow. 4th ed. Wiley, 2013. ISBN: 9781118013434.
3. Kundu, Pijush K., and Ira M. Cohen. *Fluid Mechanics*. 6th ed. Academic Press, 2015.
4. Tritton, D. J. *Physical Fluid Dynamics*. Springer, 2013. ISBN: 9780442301323.
5. H. D. Baehr and K. Stephan: Heat and Mass Transfer.
6. J. L. Bansal: Viscous Fluid Dynamics.
7. A. Bejan: Convection Heat Transfer.
8. J. A. Shercliff: A Text Book of Magnetohydrodynamics, Pergamen Press.
9. Milton- Von Dyke: Perturbation Techniques in Fluid Mechanics.
10. L. Rosenhead: Laminar boundary layers.
11. F. Chorlton: A Text Book of Fluid Dynamics by, CBS.
12. Schaum's Series: Fluid Dynamics, 3rd Edition.

SEMESTER-I
(Elective Paper-II)
MTH – 735(E)
(ALGEBRA)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: Students are expected to get acquainted with the topics- commutative and non-commutative algebra, category theory, Goldie dimension, algebraic geometry, lie groups, algebraic graphs theory, theoretical computer science etc., then this module will certainly guides the students.

Unit	Contents
I	Rings and Ideals: Basic overview; Maximal ideals; Algebra of Ideals; Quotient Ring; Local Ring; Modules: Basic properties of Modules; Simple Modules.
II	Chain conditions; ascending chain conditions on modules; maximal condition; Noetherian modules; descending chain conditions; minimal condition, Artinian modules; their properties. Chain conditions of rings; Noetherian rings; Artinian rings; Jacobson and nil-Radicals.
III	Essential submodules and Essential Extensions; Uniform modules; Superflous submodules; Hollow modules; Semi simple Modules; The Singular Submodules;Goldie dimension: Definition and Examples only.

References

1. M. F. Atiyah and I. G. Macdonald: Introduction to Commutative Algebra, Addition Wesley,2000.
2. S. Lang: Algebra, Addition –Wesley Publication Company, London, 2000.
3. C. Musili: Introduction to Rings and Modules, Narosa Publishing House, New Delhi, 1999.
4. K. R. Gooderal: Rings Theory Nonsingular Rings and Modules, Marcel Dekker Inc, NewYork, 1976
5. M. Reid: Undergraduate Commutative Algebra; London, Math. Soc. 1995
6. H. Matsumara: Commutative Algebra; Benjamin/ Cummings Pub. Company, 1980.
7. A. W. Chatters and C. R. Hajarnavis:An Introduction Course in Commutative Algebra;
Oxford University Press, 1960.
8. David Eisenbud: Commutative Algebra; Springer 1960.
9. T.Y. Lam: A first course in non-commutative rings; Springer,1990.

SEMESTER-I
(Elective Paper-II)
MTH – 736(E)
(Number Theory and Special Functions)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The course provides a foundation to number theory, q-series and their applications in the field of partition theory. The paper encourages research in the areas of mathematics inspired by Ramanujan.

Unit	Contents
I	Linear congruence, Diophantine equation, representations of number as of two squares and three squares, Fermat's last theorem.
II	Partition of positive integer, partition function p(n), generating functions, partition into odd parts and distinct parts, Jacobi's triple product identity, Euler's pentagonal number theorem.
III	Q-series, Ramanujan's general theta-function and its special cases. Ramanujan's congruences for partition functions.

References

1. David M. Burton: Elementary Number theory, Universal Book Stall, New Delhi, 2004.
2 T. M. Apostol: Introduction to Analytic Number Theory, Springer International Student Edition, Narosa Publishing House, Fourth Reprint, 1993.
3. George E Andrews: The Theory of Partition, Cambridge University Press, 1984
4. Bruce C Berndt: Number Theory in the Spirit of Ramanujan, American Mathematical Society (Indian Edition), 2013

SEMESTER-I
(Elective Paper-II)
MTH – 737(E)
(Fuzzy Sets and Fuzzy Logic)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The course provides a foundation to Fuzzy Sets and Fuzzy Logic.

Unit	Contents
I	Fuzzy sets - basic definitions, alpha-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.
II	Fuzzy relations and fuzzy graphs, composition of fuzzy relations, min-max composition and its properties, fuzzy equivalence relations, fuzzy graphs.
III	Fuzzy logic, fuzzy propositions, fuzzy quantifiers, linguistic variables, inference from conditional fuzzy propositions, compositional rule of inference

References

1. G. J. Klir and B. Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications (Prentice Hall of India, New Delhi, 1997).
2. H. J. Zimmermann, Fuzzy set theory and its Applications (Allied publishers Ltd., New Delhi, 1991.)
3. D. Dubois and H. Prade, Fuzzy sets and systems: theory and applications (Academic Press, New York, 1980).
4. A. Kandel, Fuzzy mathematical techniques with applications (Addison-Wesley, Reading, Mass,1986).
5. A. Kaufmann, and M. M. Gupta, Introduction to fuzzy arithmetic: theory and applications (Van Nostrand Reinhold, New York, 1985). 4. B. Kosko, Fuzzy thinking: the new science of fuzzy logic (Flamingo, 1994).

SEMESTER-I
(Elective Paper-II)
MTH – 738(E)
(Research In Mathematical Education)
(L-4, T-0, P-0)

Maximum marks	**:** 100 (Pass Mark: 55%)
End Semester	**:** 80
Internal Assessment	**: 20**
Contact hour per week	**:** 04
Credits	**:** 04
Terminal Examination duration	**:** 3 hours

Course Outcome: The course provides a foundation to Fuzzy Sets and Fuzzy Logic.

Unit	Contents
I	**Concept of Mathematical Education:** Importance of Mathematical Education at elementary and secondary level, Null hypotheses. Questionnaires, Sampling, Data Collection, Data Analysis and Interpretation of Data via T-Test, Chi-Square Test etc., Correlation analysis. Regression Analysis,Importance of Teaching and Learning in Mathematics.
II	**Research Design:** Concept of Hypothesis in Research Design, Development of Pedagogic Research methods, Technological Pedagogical Content Knowledge (TPCK) in Mathematics, Development of Mathematics Curricula, Text Books, modules and other Resources, Uses of ICT in Mathematics Teaching, Mathematics Achievements in Primary & Secondary Level, Gender Analysis, Socio-economic status.
III	**Research Tools:** Uses of Fuzzy Logic, MATLAB and SPSS in analyzing Data's of various parameters.
IV	**Project Report:** Project Report in consonance with the course covered by this course. **(Record–10,Presentation & Viva–15)**

References

1.L. Mishra: Teaching of Mathematics (2008), A.P.H. Publishing Corporation, New Delhi.

2.Meaning in Mathematics, July 14, 2011, John Polkinghorne, Oxford University Press.

3.C. S. Seshadri: Studies in the History of Indian Mathematics (Culture and History of Indian Mathematics), 15 Aug 2010, Hindustan Book Agency.

4.P. Kupar & K. Nissinen: Background factors behind mathematics achievement in Finnish education context. Available on line http://www.iea.nl/fileadmin/user_upload/IRC/IRC_2013/Papers/IRC-2013_Kupari_Nissinen.pdf

5.Abedi, Jamal: Lord, Carol. and Hofstetter, Carolyn. (1998): IMPACT OF SELECTED BACKGROUND VARIABLES ON STUDENTS' NAEP MATH PERFORMANCE. Available online https://www.cse.ucla.edu/products/reports/TECH478.pdf

6.NCERT.(2005).National Curriculum Framework, New Delhi.

7.Kiran Pandya, SmrutiBulsari, Sanjay Sinha; SPSS in Simple Steps, Willey India.

8. Dr. Anice James and Dr. P. S. Balasubramanium: Teaching of Mathematics, Neel Kamal Pub.*b*