

**CURRICULUM
REGULATIONS - 2015**

M.PHIL MATHEMATICS – CURRICULUM (FROM 2015-16 ONWARDS)

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
I	ZMA101	Research Methodology	4	4	0	8
	ZMA102	Algebra	4	4	0	8
	ZMA103	Analysis	4	4	0	8
		Total				24

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
II	ZMA201	Advanced Graph Theory (Guide Paper)	4	4	0	8
	ZSW202	Teaching Learning Skills	1	2	0	2
	ZMA203	Thesis/Dissertation/ Project Work – Phase I	0	0	0	6
		Total				16

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
III	ZMA301	Thesis/Dissertation/ Project Work – Phase II	0	0	0	10
		Total				10

Total Number of Credits : 50

Semester I

COURSE CODE			COURSE NAME	L	T	P	C
ZMA 101			RESEARCH METHODOLOGY	4	4	0	8
C	P	A					
4	0	0		L	T	P	H
				4	8	0	12
PREREQUISITE: Basic Statistics							
COURSE OUTCOMES:							
Course outcomes				Domain	Level		
CO1: Define and Explain data collection and thesis writing.				Cognitive	Remembering Understanding		
CO2: Apply the concept of testing of hypothesis and solve the problems.				Cognitive	Applying		
CO3: Apply the concept of CPM/PERT, Transportation problem, Assignment problem, sequencing problem and solve the problems.				Cognitive	Applying		
CO4: Define and Explain steps of algorithmic research and design of experiments				Cognitive	Remembering Understanding		
CO5: Define and Explain pedagogy and teaching skill and difference between teaching and instruction.				Cognitive	Remembering Understanding		
UNIT I RESEARCH METHODOLOGY							24
Types of Research Process, Data Collection – Primary Data, Secondary data – Thesis writing: Thesis at Tertiary level – Writing, Planning the thesis – the general format, footnotes, tables & figures, reference & appendix.							
UNIT II TEST OF HYPOTHESIS							24
Test of Hypothesis concerning means, propositions, variances, Chi Square Test, Goodness of Fit test. Non-Parametric Tests: One sample tests, Two sample tests, K-sample tests.							
UNIT III OPERATIONS RESEARCH							24
CPM/PERT Analysis, Transportation Problems, Job Sequence Problems, Assignment Problems.							
UNIT IV ALGORITHMIC RESEARCH							24
Algorithmic research problems – Types of solution procedure – steps of Development of Algorithm – Steps of Algorithm Research – Design of Experiments and Comparison of Algorithm Meta Heuristic for Combinatorial problems.							

UNIT V PEDAGOGY AND TEACHING SKILL**24**

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning a Lecture, Delivery of a lecture – Lecture with power point presentation – Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills.

LECTURE	TUTORIAL	TOTAL
60	60	120

REFERENCES

1. "Thesis & Assignment Writing" By Anderson, Berny H. Dujrston, H. Pode, Wiley Eastern Ltd., New Delhi, 1970.
2. "Operations Research" An Introduction by H.A. Taha Collier Macmillan International Edition, 1982.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, "Introduction to algorithms" Prentice Hall 1990.
4. "Research Methodology" R. Panneerselvam, PHI, New Delhi 2005.
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York.
7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi.

TABLE 1: COs VS POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2			1	1	1	1	1
CO2	3	2			1	1	1	1	1
CO3	3	2			1	1	1	1	1
CO4	3	2			1	1	1	1	1
CO5	3	2			1	1	1	1	1
Total	15	10			5	5	5	5	5
Scaled value	3	2			1	1	1	1	1

1- Low, 2- Medium, 3 – High

COURSECODE			ZMA 102	L	T	P	C
COURSE NAME			ALGEBRA	4	4	0	8
PREREQUISITE			BASIC CONCEPTS OF COMMUTATIVE ALGEBRA				
C	P	A		L	T	P	H
4	0	0		4	8	0	12
COURSE OUTCOMES				DOMAIN	LEVEL		
CO1: Define the concepts of modules and understand the key concepts introduced in this modules.				Cognitive	Remembering Understanding		
CO2: Explain the concepts of Projective and Injective modules- Homo and Duality and able to investigate the properties of modules.				Cognitive	Remembering Understanding		
CO3: Explain the concepts of Tensor Products, Modules over a principal ideal domain.				Cognitive	Understanding		
CO4: Define and recognize the basic properties of the rings of real numbers.				Cognitive	Remembering Understanding		
CO5: Using the concepts Primary decomposition, Noetherian rings, Modules and Apply the theorem in a correct mathematical way.				Cognitive	Apply		
UNIT I						12	
Modules: Modules - Homomorphisms and exact sequences – Free modules							
UNIT II						12	
Modules: Projective and Injective modules- Homo and Duality							
UNIT III						12	
Modules: Tensor Products- Modules over a principal ideal domain							
UNIT IV						12	
Commutative Rings and Modules: Chain conditions – Prime and Primary idelas							
UNIT V ORDINARY DIFFERENTIAL EQUATIONS AND APPLICATIONS						12	
Commutative Rings and Modules: Primary decomposition- Noetherian rings and Modules							

	LECTURE	TUTORIAL	TOTAL
	60	60	120
TEXT BOOKS			
1. Thomas W. Hungerford, “ Algebra”, Springer - Verlag			
UNIT-I- 4.1- 4.2, UNIT-II- 4.3 – 4.4 , UNIT-III - 4.5 - 4.6,UNIT-IV – 8.1- 8.2, UNIT-V – 8.3 - 8.4			
REFERENCES			
Fraleigh, J.B., A First Course in Abstract Algebra, Narosa Publishing House			
E REFERENCES			
1. NMEICT repository			
a) http://www.math.iitb.ac.in/~srg/Lecnotes/AfsPuneLecNotes.pdf			
b) http://www.math.iitb.ac.in/~srg/Lecnotes/comma`lg_des.html			
c) http://people.brandeis.edu/~jgusa/Math205bS10/Math205b_2010Sp.html			

COURSECODE			ZMA 103	L	T	P	C
COURSE NAME			ANALYSIS	4	4	0	8
PREREQUISITE							
C	P	A		L	T	P	H
4	0	0		4	8	0	12
COURSE OUTCOMES				DOMAIN	LEVEL		
CO1: Define Simple functions and Find Integration of positive functions and Integration of complex functions. Explain role played by sets of measure zero and Topological preliminaries				Cognitive	Remembering Understanding		
CO2: Explain The Riesz representation theorem,				Cognitive	Remembering		

Regularity properties of Borel measures and Lebesgue measure		Understanding	
CO3: Explain Convex function and inequalities and the L^p – spaces, Approximation by continuous function	Cognitive	Remembering Understanding	
CO4: Explain Inner products and linear functional, Orthogonal sets and Trigonometric series.	Cognitive	Remembering Understanding	
CO5: Explain Banach spaces, Consequences of Baire’s theorem, The Hahn Banach Theorem and Poisson integral.	Cognitive	Remembering Understanding	
Unit-I Abstraction Integration		24	
Simple functions – Arithmetic in $[0, \infty]$ - Integration of positive functions – Integration of complex functions – The role played by sets of measure zero. Topological preliminaries			
Unit-II The Lebesgue Integral		24	
The Riesz representation theorem – Regularity properties of Borel measures – Lebesgue measure			
Unit-III The L^p – spaces		24	
Convex function and inequalities – The L^p – spaces – Approximation by continuous function			
Unit-IV Inner Product space		24	
Inner products and linear functional – Orthogonal sets – Trigonometric series.			
Unit-V Banach Space		24	
Banach spaces – Consequences of Baire’s theorem – The Hahn Banach Theorem – An abstract approach to the Poisson integral.			
	LECTURE	TUTORIAL	TOTAL
	60	60	120
TEXT BOOKS			
Walter Rudin, Real and Complex Analysis, 3 rd edition, Tata McGraw – Hill			
Chapter 1: 1.1 6, 1.1 7, 1.22 – 1.41			
Chapter 2: 2.3 – 2.4			
Chapter 3: 3.1 – 3.17			
Chapter 4: 4.1 – 4.26			
Chapter 5: 5.1 – 5.10, 5.16 – 5.25			
REFERENCES			
1. H.L. Royden, Real Analysis (4th edition), Macmillan Publishing Company, 1993.			
E REFERENCES			
1. http://nptel.ac.in/courses/111101005/1-40			

2. http://people.brandeis.edu/~igusa/Math205bS10/Math205b_2010Sp.html

Semester II

COURSE CODE			COURSE NAME			L	T	P	C	
ZMA201			ADVANCED GRAPH THEORY (Guide Paper)			4	4	0	8	
C	P	A								
4	0	0				L	T	P	H	
						4	8	0	12	
PREREQUISITE:										
COURSE OUTCOMES:										
Course outcomes						Domain	Level			
CO1: Define and Explain connectivity in graphs						Cognitive	Remembering Understanding			
CO2: Apply coloring of graphs and solve problems in Vertex colorings and Edge colouring						Cognitive	Applying			
CO3: Define and Explain planar graphs						Cognitive	Applying			
CO4: Define and Explain Ramsey Theory						Cognitive	Remembering Understanding			
CO5: Find different types of graph labelings for different types of graphs						Cognitive	Remembering Understanding			
UNIT I CONNECTIVITY IN GRAPHS									24	
Vertex connectivity – Edge connectivity – Blocks – k-connected and k-edge connected graphs – Network flow problems.										
UNIT II COLORING OF GRAPHS									24	

Vertex colorings and upper bounds – Brooks’ theorem – Graphs with large chromatic number – Turan’s theorem – Counting proper colorings – Edge colouring – Characterization of line graphs.		
UNIT III PLANAR GRAPHS		24
Embeddings and Euler’s formula – Dual graphs – Kuratowski’s theorem – 5 colour theorem – Crossing number.		
UNIT IV RAMSEY THEORY		24
The pigeonhole principle – Ramsey’s theorem – Ramsey numbers – Graph Ramsey theory. The characteristic polynomial – Linear algebra of real symmetric matrices – Eigenvalues and graph parameters – Eigenvalues of regular graphs.		
UNIT V GRAPH LABELING		24
Types of labeling – graceful labeling – harmonious labeling – odd graceful, even graceful, magic labeling.		
LECTURE	TUTORIAL	TOTAL
60	60	120
TEXT BOOK:		
1. Douglas B. West, “Introduction to Graph Theory”, Prentice Hall of India, Second Edition, 2002.		
REFERENCES		
1. Bondy J. A, and Murty U. S. R., “Graph Theory”, Springer, 2008.		
2. Balakrishnan R. and Ranganathan K., “ A textbook of Graph Theory”, Springer, 2012.		
3. Graham R.L., Rothschild B.L and Spencer J.H., “Ramsey Theory”, Wiley Publishers, Second Edition, 1990.		
4. Biggs N., “Algebraic Graph Theory”, Cambridge Tracts in Mathematics 67, Cambridge University Press, 1994. MX8003 Algebraic Theory of Semigroups		
E REFERENCES		
NMEICT repository http://nptel.ac.in/courses		

COURSE CODE			COURSE NAME	L	T	P	C
ZSW202			TEACHING LEARNING SKILLS	1	2	0	2
C	P	A					
2	0	0		L	T	P	H
				1	2	0	3
PREREQUISITE: Nil							
COURSE OUTCOMES:							
Course outcomes				Domain	Level		
CO1: Define and Explain the role of a teacher in different phases of teaching.				Cognitive	Remembering Understanding		
CO2: Define and Explain various micro teaching skills.				Cognitive	Remembering Understanding		
CO3: Define and Explain the Learning and different methods of teaching.				Cognitive	Remembering Understanding		
CO4: Define and Explain the importance of teaching devices and techniques.				Cognitive	Remembering Understanding		
CO5: Apply the concept and solve the problems using SPSS.				Cognitive	Applying		
UNIT I CONCEPT OF TEACHING							6
Teaching- an art or a science? - Relationship between Teaching and Learning. Analysis of the concept of Teaching - Teaching as a deliberately - planned process: Analysis in terms of teaching skills - General Model of instruction – Pre active, Interactive and Post active - phases and Teachers role in them.							
UNIT II SKILLS IN TEACHING							6
Microteaching skills – need, procedure, cycle of operations and uses – set induction, stimulus variation, reinforcement, questioning, illustrating, explaining demonstrating, using black board, link lesson and closure							
UNIT III CONCEPTS OF LEARNING							6
Nature and importance of learning – Individual differences in learning - Learning Curves- Factors influencing the learning- theories of learning - Transfer of Learning- Learning by Imitation.							
UNIT IV TECHNIQUES OF TEACHING-LEARNING – LARGE GROUP							6

Lecturing - Place in Higher Education - Purposes served - Basic skills - Evaluation of Effectiveness. Demonstration - Video conferencing - Method of organizing - Advantages and disadvantages as a teaching learning process. Use of Audio Visual Aids – Importance - General Principles of use - Advantages and disadvantages.

Techniques of teaching-learning – Small group

Importance, Skills of using, Evaluation of Effectiveness of the following:

Group discussion - Collaborative learning - Seminar - Debate - Group investigation - Role play.

UNIT V INTRODUCTION TO SPSS

6

Introduction to SPSS - Data analysis with SPSS: general aspects, workflow, critical issues - SPSS: general description, functions, menus, commands - SPSS file management.

LECTURE	TUTORIAL	TOTAL
10	20	30

REFERENCES

1. Davis, Irork (1971), The Management of learning, McGraw Hill, London.
2. Judith, I. (2008). Learners, learning and educational activity. London: Routledge.
3. Graham, R. (2008). Psychology: The key concepts. London: Routledge.
4. Samuel, W. (2007). The intellectual and moral development of the present age. U.S: Kessing Pub Co.
5. Chobra, R. K. (2006). Elements of educational psychology. New Delhi: Arise Publishers.
6. Langer, J. and Applebee, A.N. (1987). How writing shapes thinking: A Study of Teaching and Learning, National Council of Teachers of English.
7. Lindfors, J. (1984). How children learn or how teachers teach? A Profound confusion: Language Arts, 61 (6), 600-606.
8. Vygotsky, L.S. Thought and Language, Cambridge, MA: MIT Press, 1962.
9. Field A., Discovering Statistics Using SPSS, Fourth Edition, SAGE, 2013

Resource Websites:

- <http://www.thirteen.org/edonline/concept2class/constructivism/index.html>.
- www.ipn.uni-kiel.de/projekte/esera/book/b001-cha.pdf
- <http://www.ericdigests.org/1999-3/theory.htm>
- <http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at6lk36.htm>
- <http://saskschoolboards.ca/research/instruction/97-07.htm>
- http://www.ed.psu.edu/CI/Journals/1998AETS/t1_7_freeman.rtf
- http://en.wikipedia.org/wiki/Constructivist_teaching_methods

- <http://www.ncrel.org/sdrs/areas/issues/envrnmnt/drugfree/sa3const.htm>
- <http://vathena.arc.nasa.gov/project/teacher/construc.html>
- <http://www.grout.demon.co.uk/Barbara/chreods.htm>
- <http://vathena.arc.nasa.gov/project/document/teacher.html>
- http://www.disciplineassociates.com/ClassroomDiscipline_101.aspx