CURRICULUM

REGULATIONS – 2016

M.PHIL MATHEMATICS – CURRICULUM (FROM 2016-17 ONWARDS)

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	ZMA101	Research Methodology	4	4	0	6
	ZMA102	Algebra & Analysis	4	4	0	6
I	ZMA103	Advanced Graph Theory	4	4	0	6
		Total				**18**

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	ZMA201	Mathematical Statistics (Guide Paper)	4	0	0	4
	ZSW202	Teaching Learning Skills	1	2	0	2
II	ZMA202	Research Project - Dissertation	0	0	0	16
		Total				**22**

Total Number of Credits   : 40

Semester I

COURSE CODE			COURSE NAME	L	T	P	C
ZMA101			RESEARCH METHODOLOGY	4	4	0	6
C	P	A					
4	0	0		L	T	P	H
				4	4	0	8

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	18

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	18

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	18

CPM/PERT Analysis, Transportation Problems, Job Sequence Problems, Assignment Problems.

UNIT IV ALGORITHMIC RESEARCH	18

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	18

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	30		90

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.

COURSECODE	ZMA102	L		T	P	C
COURSE NAME	ALGEBRA & ANALYSIS	4		4	0	6
PREREQUISITE	BASIC CONCEPTS OF COMMUTATIVE ALGEBRA					

C	P	A		L		T	P	H
4	0	0		4		4	0	8

COURSE OUTCOMES	DOMAIN	LEVEL
CO1: Define and **explain** the concept modules.	Cognitive	Remembering Understanding
CO2: Define and Explain the concepts of Noetherian Rings.	Cognitive	Remembering Understanding

CO3: Define and Explain the concepts of Topological preliminaries and measurable functions.	Cognitive	Understanding
CO4: Define and **explain** Fourier Transforsms	Cognitive	Remembering Understanding
CO5: Define and **explain** Riemann Mapping Theorem	Cognitive	Remembering Understanding

UNIT I MODULES	18

Basic definitions – Group of homomorphisms – Direct products and sums of modules – Free modules – Vector spaces – The dual space and dual module.

UNIT II NOETHERIAN RINGS	18

Basic criteria – Associated primes – Primary decomposition - Nakayama's lemma.

UNIT III RIESZ REPRESENTATION THEOREM	18

Topological preliminaries - Riesz representation theorem – Regularity properties of Borel measures –Lebegue measure – continuity properties of measurable functions.

UNIT IV FOURIER TRANSFORSMS	18

Formal properties – Inversion theorem – The Plancherel theorem – Banach Algebra L^1

UNIT V RIEMANN MAPPING THEOREM	18

Preservation of angles – Linear fractional transformations – Normal families - Riemann Mapping Theorem.

	LECTURE	TUTORIAL	TOTAL
	60	30	90

TEXT BOOKS

1. Serge Lang, "Algebra", Springer - Verlag, Revised Third Edition, 2002.
   Unit – I - Chapter III: Sections 1 to 6
   Unit – II - Chapter X: Sections 1 to 4.

2. W. Rudin, "Real and Complex Analysis", 3rd edition, McGraw Hill International,1986.
   Unit III – Chapter 2; Unit IV – Chapter 9; Unit V - Chapter 14

REFERENCES

1. C. Musili, "Rings and Modules", 2nd edition, Narosa, 1994.

2. P.B. Bhattacharya et al., "Basic Abstract Algebra", 2nd edition, Cambridge University Press, 1995.
3. Serge Lang," Complex Analysis", Addison Wesley, 1977.
4. V. Karunakaran, "Complex Analysis", 2nd edn, Narosa, New Delhi, 2005.

E REFERENCES

NMEICT repository
   http://nptel.ac.in/courses

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, Regularity properties of Borel measures and Lebesgue measure	Cognitive	Remembering 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,∞] - 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, 3rd 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

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

Semester **II**

COURSE CODE			COURSE NAME	L	T	P	C
ZMA201			**MATHEMATICAL STATISTICS**	**4**	**0**	**0**	**4**
C	**P**	**A**					
4	**0**	**0**		**L**	**T**	**P**	**H**
				4	**0**	**0**	**4**

PREREQUISITE: Nil

COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Estimation Theory.	Cognitive	Remembering Understanding
CO2: Explain and solve Tests based on normal, t and f distributions for testing of means, variance and proportions – Analysis of r × c tables – Goodness of fit	Cognitive	Understanding Applying
CO3: Explain and solve Correlation And Regression.	Cognitive	Understanding Applying
CO4: Explain and solve Design of Experiments	Cognitive	Understanding Applying
CO5: Explain and solve Statistical Quality Control by X , R charts, p, c and np charts.	Cognitive	Understanding Applying

UNIT I Estimation Theory	**12**
Estimators: Un biasedness, Consistency, Efficiency and Sufficiency – Maximum likelihood estimation – Method of moments.	

UNIT II Testing Of Hypothesis	**12**
Tests based on normal, t and f distributions for testing of means, variance and proportions – Analysis of r × c tables – Goodness of fit.	

UNIT III Correlation And Regression	**12**

Multiple and Partial correlation – Method of least squares – Plane of Regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation - Multiple correlation with total and partial correlation – Regression and Partial correlations in terms of lower order co-efficient.

UNIT IV Design of Experiments	12

Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT V Statistical Quality Control	12

 Analysis of variance: Control charts for measurements (X and R charts) – control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling, Introduction to SPSS.

LECTURE		TOTAL
60		60

TEXTBOOK

1. Gupta. S.C., and Kapoor. V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and sons, Thirteenth Edition, 2014.

REFERENCES

1. J.E. Freund, "Mathematical Statistical", 5th Edition, Prentice Hall of India, 2001.

2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences",5th Edition, Thomas and Duxbury, Singapore, 2002.

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