A.V.V.M. SRI PUSHPAM COLLEGE (AUTONOMOUS), POONDI

Programme: M. Sc.
Department: Mathematics

Syllabus Revision 2017-2018

S.No.	Courses	Number of courses having changes
1.	Core Course	06
2.	Elective Course	01
	TOTAL	07

Total Number of Courses : 23

Total Number of Courses having changes : 07

Percentage of Revision : 30.4 %

Note:

The content of the syllabus which has been revised is highlighted.

M.Sc. MATHEMATICS (2017 - 2018)

S. No.	Semester	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours/ Week	Credits
					CIA	EE	Total	CIA	EE	Total		
1	I	Core	17P1MAC1	Linear Algebra	25	75	100	10	30	50	6	5
2		Core	17P1MAC2	Real Analysis – I	25	75	100	10	30	50	6	5
3		Core	17P1MAC3	Ordinary Differential Equations	25	75	100	10	30	50	6	5
4		Core	17P1MAC4	Stochastic Processes	25	75	100	10	30	50	6	4
5		Major Elective-I	17P1MAEL1A 17P1MAEL1B	Classical Dynamics (or) Fluid Dynamics	25	75	100	10	30	50	6	4
6	II	Core	17P2MAC5	Algebra	25	75	100	10	30	50	5	5
7		Core	17P2MAC6	Complex Analysis	25	75	100	10	30	50	5	4
8		Core	17P2MAC7	Partial Differential Equations	25	75	100	10	30	50	5	4
9		Core	17P2MAC8	Mathematical methods	25	75	100	10	30	50	5	4
10		Core	17P3MAC9	Optimization Techniques	25	75	100	10	30	50	5	5
11		Major Elective-II	17P2MAEL2A 17P2MAEL2B	Mathematical Probability (or) Mathematical Modeling	25	75	100	10	30	50	5	4
12	III	Core	17P3MAC10	General Topology	25	75	100	10	30	50	5	4
13		Core	17P3MAC11	Differential Geometry	25	75	100	10	30	50	5	3
14		Core	17P3MAC12	Real Analysis – II	25	75	100	10	30	50	5	4
15		Core	17P3MAC13	Programming in C++	25	75	100	10	30	50	5	3
16		Core-Practical	17P3MACPL	Programming in C++ Practical	40	60	100	10	30	50	5	2
17		EDC	17P3MAEDC	Extra disciplinary course - Applicable Mathematical Techniques	25	75	100	16	24	50	4	-
		Communicative Skill & Personality Development			-	-	-	-	-	-	1	-
18	IV	Core	17P4MAC14	Functional Analysis	25	75	100	10	30	50	6	5
19		Core	17P4MAC15	Graph Theory and its application	25	75	100	10	30	50	6	5
20		Core	17P4MAC16	Cryptography	25	75	100	10	30	50	6	5
21		Major Elective-III	17P4MAEL3A 17P4MAEL3B	Advanced Numerical Analysis (or) Design and Analysis of Algorithms	25	75	100	10	30	50	6	4
22		CN	17P4MACN	Comprehension	-	100	100	-	50	50	5	2
23		Project	17P4MAPR	Project	40	60	100	16	24	50	-	4
		Communicative Skill & Personality Development			-	-	-	-	-	-	1	-
		Total					**2300**				**120**	**90**

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**17P1MAC3**	**ORDINARY DIFFERENTIAL EQUATIONS**	**6**	**5**

Objectives:

- Teaching the theory and applications to students preparing for advanced training in applied sciences and social sciences.
- Presenting in easy and lucid language the results of oscillations, boundary valued Problems (BVP) and elements of control theory.
- Justifying the inclusion of qualitative theory to students who think that it is out of place.
- Emphasizing the importance of the study of Boundary value problems, both in Mathematics and in the applied sciences.
- Studying about the stability of stationary solutions

Unit I **18 Hrs**

Systems of linear Differential equations: Systems of first order equations – Existence and uniqueness theorem-Fundamental matrix-Non –homogeneous linear systems-linear systems with constant coefficients-linear systems with periodic coefficients.

Unit II **18 Hrs**

Existence and Uniqueness of solutions: Preliminaries-successive approximations-Picard's theorem –Non uniqueness of solutions-continuation and dependence on initial conditions-Existence of solutions in the large-Existence and uniqueness of solutions of systems.

Unit III **18 Hrs**

Oscillations of second order equations: Fundamental results - Strurm's comparison theorem – Elementary linear oscillations - comparison theorem of Hille-Winter –Oscillation of x''+ a(t)x=0 - Elementary nonlinear oscillations.

Unit IV **18 Hrs**

Boundary Value Problems: Introduction - Sturm-Liouville Problem - Green's functions - Non-existence of solutions - Picard's theorem.

Unit V **18 Hrs**

Behaviour of solution of Linear differential equation: n^{th} order equations – Elementary critical points - Critical points of nonlinear systems-linear systems with constant coefficients - linear systems with variable coefficients – second order linear differential equations.

Text Book:

Ordinary Differential equations and stability theory – S.G.Deo & V.Ragavendra

Unit I : Chapter 4
Unit II : Chapter 5
Unit III : Chapter 6
Unit IV : Chapter 7
Unit V : Chapter 8

General References:

1. Differential equations with applications and historical notes –George F Simmons Tata McGraw Hill Ltd New Delhi 1972.
2. Theory of ordinary differential equations EA coddington, N .Levinson-tata McGraw Hill New Delhi 1982.

Semester	Subject Code	Title of the paper	Hours of Teaching /Week	No. of Credits
I	**17P1MAC4**	**STOCHASTIC PROCESSES**	**6**	**4**

Objectives

- To introduce the basic concepts of Stochastic models.
- To learn the real life models such as Birth- Death processes.

Unit-I **18 Hrs**

Stochastic Processes- An introduction-Specification of Stochastic Processes- Definition and Examples – Transition Matrix (or Marix of Transition Probabilities) – Order of a Markov Chain – Markov Chains as Graphs.

Unit – II **18 Hrs**

Higher Transition Probabilities – Generalisation of Independent Bernoulli Trials: Sequence of chain – Dependent Trials – Markov – Bernoulli Cain – Correlated Random Walk – Classification of States and Chains – Communication relations – Class Property – Classification of States : Transient and Persistent(Current) States

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Unit –III **18 Hrs**

Determination of Higher Transition Probabilities – Aperiodic Chain : Limiting Behaviour – Stability of A Markov System – Computation of the Equilibrium Probabilities – Graphic theoretic Approach – Markov Chain with Denumerable Number of States(or countable state space)

Unit – IV **18 Hrs**

Poisson Process – Introduction – Postulates for Poisson Process - Properties of Poisson Process – Poisson Process and Related Distributions – Interarrival Time – Further Interesting Properties of Poisson Process.

Unit – V **18 Hrs**

Generalisations of Poisson Process – Poisson Process in Higher Dimensions – Poisson Cluster Process (Compound or Cumulative Poisson Process) – Pure Birth Process : Yule – Furry Process – Birth – Immigration Process – Time – dependent Poisson Processes(Non – homogeneous Poisson Process)- random Variation of the Parameter λ - Renewal Process – Birth and Death Process – Particular Cases.

Text Book :

STOCHASTIC PROCESSES – J. MEDHI -New Age International Publishers (2015)

Unit I : Chapters 1.5 to 2.1
Unit II : Chapters 2.2 to 2.4
Unit III : Chapters 2.5 to 2.8
Unit IV : Chapters 3.1 to 3.2
Unit V : Chapters 3.3 to 3.4

General References:

1. First course in Stochastic process by Samuel karlin.
2. Stochastic process by Srinivasan and Menta.

Semester	Subject Code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**17P1MAEL1A**	**Major Elective – I CLASSICAL DYNAMICS**	**6**	**4**

Objectives:

- Classical mechanics afford the student an opportunity to master many of mathematics techniques.
- It is certainly true that classical mechanics today is far from being a closed subject.
- Alternate means exist in the curriculum for acquiring the mathematics needed in other branches.

Unit I **18 Hrs**

INTRODUCTORY CONCEPTS: The mechanical systems - Generalized Coordinates-Constraints –Virtual work – Principle of virtual work – D'Alemberts principle – Examples – Generalized force - Example

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Unit II **18 Hrs**

LAGRANGE'S EQUATIONS: Derivation of Lagrange's Equations – Examples – Integral of the motion – Ignorable coordinates – the Routhian function – example – Lioville's system – examples.

Unit III **18 Hrs**

SPECIAL APPLICATIONS OF LAGRANGE'S EQUATIONS: RAYLEIGH'S Dissipation Function - impulsive motion - Gyroscopic systems – small motions – Gyroscopic stability – examples.

Unit IV **18 Hrs**

HAMILTON'S EQUATIONS: Hamilton's principle – Hamilton's equations - other variational principles – Principle of least action – example.

Unit V **18 Hrs**

Hamilton's Principal function – the canonical integral – Pfaffian forms - The Hamilton-Jacobi Equation - Jacobi's theorem - example.

Text Book

"CLASSCIAL DYNAMICS" *– DONALD T.GREENWOOD, Prentice Hall of India Private Ltd New Delhi - 110001(1979)*

Unit I : Chapter 1-sec 1.1, 1.2, 1.3, 1.4, 1.5
Unit II : Chapter 2-sec 2.1, 2.2, 2.3,
Unit III : Chapter 3 –sec 3.1, 3.2, 3.3,
Unit IV : Chapter 4 –sec 4.1, 4.2, 4.3,
Unit V : Chapter 5-sec 5.1, 5.2

General References:

Herbert Goldstein" Classical Mechanics" Second Edition Narosa Publishing House-New Delhi.

Semester	Subject code	Title of the paper	Hours of Teaching / Week	No.of Credits
II	**17P2MAC5**	**ALGEBRA**	**5**	**5**

Objectives:

- Group Theory is the fundamental building blocks for the Abstract algebra.
- To study the algebraic aspects of Real and complex numbers.
- Module is a third algebraic Model –Applicable to geometry and physics.

Unit I **19 Hrs**

Group Theory: Sylow's theorem –Direct products-Finite Abelian groups.

Unit II **19 Hrs**

Ring theory: Polynomial Rings-polynomials over the Rational Fields-polynomial Rings over Commutative Rings-Modules.

Unit III **19 Hrs**

Fields: Extension fields-Roots of polynomials-More about roots.

Unit IV **18 Hrs**

Fields: The Elements of Galois theory - Finite fields

Unit V

Linear transformations: The Algebra of Linear transformations - Characteristic roots - Hermition, Unitary and normal transformations.

Text Book:

Topics in Algebra. *I.N. Herstein 2nd Edition-Wiley Eastern Limited-1975.*

Unit I : Chapter 2 (2.12 to 2.14) Pages: 91 – 115

Unit II : Chapter 3 (3.9 to 3.11), Chapter 4(4.5) Pages: 153 – 166, 201 – 205

Unit III : Chapter 5 (5.1, 5.3, 5.5) Pages: 207 – 214, 219 – 226, 232 - *236*

Unit IV : Chapter 5 (5.6), Chapter 7(7.1) Pages: 237 – 249, 355 - 360

Unit V : Chapter 6 (6.1, 6.2, 6.10) Pages: 269 – 272, 336 – 348

General References:

1. *Algebra: Serge Lang*
2. *Modern Algebra: Vander worden vol.1& vol.2.Objective.*

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**17P2MAC7**	**PARTIAL DIFFERENTIAL EQUATION**	**5**	**4**

Objectives:
- To introduce notion of partial differentiated equations.
- To give an awareness about methods of integral transforms.
- To study boundary value problems

Unit I **19 Hrs**

Partial Differential Equations of first order: Partial Differential Equations – Cauchy's problem for First order Equations-linear Equations of the first Order-Integral surfaces passing through a given curve-surfaces orthogonal to a given system of surfaces-compatible systems of First-order Equations.

Unit II **19 Hrs**

Charpit's Method-Jacobi's method - **Partial Differential Equations of second order:** Linear Partial Differential Equations with constant coefficients-Equations with Variable coefficients - Separation of Variables –The method of Integral Transforms.

Unit III **19 Hrs**

Laplace's Equation: Elementary Solutions of Laplace's Equation-Families of Equipotential Surfaces – Boundary Value Problems-Separation of Variables - The theory of Green's Function for Laplace's Equations.

Unit IV **18 Hrs**

The Wave equation: The occurrence of the wave equation in Physics-Elementary solutions of the one dimensional wave equation-The Riemann –Volterra solution of the one dimensional wave equation-vibrating membranes: Application of the calculus of variations-General solutions of the wave equation.

Unit V

The Diffusion Equation: The resolution of Boundary value problems for the Diffusion Equation-Elementary solutions of the Diffusion Equation-Separation of Variables –The use of Integral transforms –The use of Green's functions.

Text Book:-

Elements of Partial Differential equations, Ian Sneddon, International Student edition

Unit I : Chapter 2 : sec. 2.1,2.3 to 2.6,2.9
Unit II : Chapter 3 : sec. 2.10, 2.11, 3.4,3.5,3.9,3.10
Unit III : Chapter 4 : sec. 4.2, to 4.5, 4.8
Unit IV : Chapter 5 : sec. 5 1 to 5.4,5.6
Unit V : Chapter 6 : sec. 6.2 to 6.6

General References :

1. *Partial Differential Equation* 3rd Edition, John F., Narosa 1979.
2. Introduction to partial Differential Equation second Edition, K.Sankara Rao, Prentice-Hall of India 2005.

Semester	Subject code	Title of the paper	Hours of Teaching / Week	No. of Credits
II	**17P2MAC9**	**OPTIMIZATION TECHNIQUES**	**5**	**5**

Unit I **19 Hrs**

Integer programming problem: Gomory's All - IPP method – Gomory's mixed integer method – Branch and Bound method.

Unit II **19 Hrs**

Dynamic programming: The recursive equation approach – characteristics of Dynamic programming – Dynamic programming algorithms – The solution of L.P.P. by Dynamic programming.

Unit III **19 Hrs**

Non Linear Programming Problem: General Non-LPP – Problems of Constrained maxima and minima – graphical solution – Kuhn Tucker Condition (non negative constraints) – Quadratic Programming – Wolfe's modified simplex method.

Unit IV **18 Hrs**

Queuing Theory: Queuing system – characteristic of queuing system – symbols and notations – Poisson process of exponential distribution – classification of queues – definition of transient and steady states – Poisson queues – non-Poisson queuing systems – the M/G/1 Queuing system

Unit V

Inventory Control: Reasons for Carrying Inventory – Types of Inventory – The Inventory Decisions – Economic Order Quantity – Deterministic Inventory Problem – EOQ Problem with Price-Breaks – Multi-item – Deterministic Problem

Text Book:

Problem in operations Research, *PK Gupta & ManMohan (Relevant portions only)*

Unit - I : Chapter 12 (pages 219 – 242)

Unit - II : Chapter 18 (pages 379 – 399)

Unit - III : Chapter 25, 26 (pages 609 – 623, 627 - 636)

Unit - IV : Chapter 22 (pages 495 - 519)

Unit - V : Chapter 23 (pages 529 – 556)

Reference:

Operations Research: Kantiswarup, PK. Gupta and Man Mohan.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
III	**17P3MAC12**	**REAL ANALYSIS – II**	**5**	**4**

Unit I **15 Hrs**

Riemann –Stieltjes. Integral: Introduction –Notation-The definition of the Riemann-Stieltjes integral-Linear properties-Integration by parts-Change of variable in a Riemann –integral –step functions as integrators –Reduction of a Riemann–Stieltjes integral to a finite sum-Euler's summation formula-monotonically increasing integrators. Upper and lower integrals –Additive and linearity properties of upper and lower integrals-Riemann's condition-Comparison theorems –Integrators of bounded variation.

Unit II **15 Hrs**

Riemann –Stieltjes. Integral: Sufficient conditions for existence of Riemann –Stieltjes integrals-Necessary conditions for existence of Riemann –Stieltjes integral-Mean value Theorems for Riemann-Stieltjes integrals-the integrals as a functions of the interval-Second fundamental theorem of integrals calculus-Change of variable Riemann integral-Second Mean value Theorem for Riemann integrals-Riemann –Stieltjes integrals depending on a parameter-Differentiation under the integral sign-interchanging the order of integration.

Unit III **15 Hrs**

Infinite Series and Infinite Products: Introduction –Convergent and divergent sequences of complex numbers-Limit superior and limit inferior of a real-valued sequence-monotonic sequences of real numbers-Infinite series-inserting and removing parantheses-Alternating series-Absolute and conditional convergence-Real and imaginary parts of a complex series-Tests for convergence of series with positive terms. The geometric series- The integral test –The big oh and little oh notation –The ratio test and the root test-Dirichlet's test and Abel's test.

Unit IV **15 Hrs**

Sequences of Functions: -Point wise convergence of sequences of functions –examples of sequences of real –valued functions-Definition of uniforms convergence-Uniform convergence and continuity –The cauchy condition for uniform convergence–Uniform convergence of infinite series of functions-Uniform convergence and Riemann–Stieltjes intergration-uniformly convergent sequences that can be integrated term by term-Uniform convergence and differentiation-sufficient conditions for uniform convergence of a series.

Unit V **15 Hrs**

The Lebesgue integral: Introduction- The integral of a step function – Monotonic sequences of step functions – Upper functions and their integrals - Riemann integrable functions as examples of upper functions - The class of Lebesgue integrable functions on a general interval – Basic properties of Lebesgue integral – Lebesgue integration and sets of measure zero – The Levi monotone convergence theorem – The Lebesgue dominated convergence theorem.