St. PETER'S UNIVERSITY

St. Peter's Institute of Higher Education and Research
(Declared Under Section 3 of the UGC Act, 1956)
AVADI, CHENNAI – 600 054
TAMIL NADU

M.Sc. (MATHEMATICS)
Code No. – 416
(Effective From **2009 – 2010**)
(Distance Education)

Regulations and Syllabi
(I & II Year)

St. PETER'S INSTITUTE OF DISTANCE EDUCATION
Recognized by Distance Education Council and
Joint Committee of UGC – AICTE - DEC, New Delhi
(Ref. F. No. DEC/SPU/CHN/TN/Recog/09/14 dated 02.04.2009 and Ref.F.No.DEC/Recog/2009/3169 dated 09.09.2009)

St. PETER'S UNIVERSITY

St. PETER'S INSTITUTE OF DISTANCE EDUCATION

Chennai – 600 054.

Code No. – 416

M.Sc. (MATHEMATICS)

(Distance Education)

Regulations and Syllabi

(Effective from 2009 – 2010)

1. **Eligibility:** Candidates who have passed B.Sc. Examination with Mathematics as main subject of the University or any other University recognized by the University as equivalent thereto, are eligible for admission to Two Year M.Sc. Programme in Mathematics.

2. **Duration:** Two Years.

3. **Medium:** English is the medium of instruction and examination.

4. **Methodology:** The methodology of distance education includes the supply of self-instructional study materials in print format and in CD, face-to-face instruction for theory and practicals for a limited period during week ends and on holidays, provision of virtual class in phased manner, dissemination of information over e-mail, Student - Support Service at various Centres of the University, Continuous Assessment and End Assessment conducted by the University at various parts of India.

5. **Weightage for Continuous and End Assessment:** There is no weightage for Continuous Assessment unless the ratio is specifically mentioned in the scheme of Examinations. The End Assessment (EA) has 100% weightage.

6. Credit System: Credit system be followed with 36 credits for each Year and each credit is equivalent to 25-30 hours of effective study provided in the Time Table of the formal system.

7. Scheme of Examinations

First Year

Code No.	Course Title	Credit	Marks	
Theory			**EA**	**Total**
109PMMT01	Topology	9	100	100
109PMMT02	Complex Analysis	9	100	100
109PMMT03	Differential Equations	9	100	100
109PMMT04	Fluid Dynamics	9	100	100
	Total	**36**	**400**	**400**

Second Year

Code No.	Course Title	Credit	Marks	
Theory			**EA**	**Total**
209PMMT01	Abstract Algebra	9	100	100
209PMMT02	Linear Algebra	9	100	100
209PMMT03	Operations Research	9	100	100
209PMMT04	Computational Numerical Methods	9	100	100
	Total	**36**	**400**	**400**

8. Passing Requirements: The minimum pass mark (raw score) be 50% in End Assessment.

9. Grading System: Grading System on a 10 Point Scale be followed with 1 mark = 0.1 and the conversion of the Grade point as given below.

$$\text{Overall Grade Point Average (OGPA)} = \frac{\text{Sum of Weighted Grade Points}}{\text{Total Credits}}$$

$$= \frac{\Sigma\,(EA)C}{\Sigma C}$$

10. The Overall Grade: The Overall Grade and Classification of all successful candidates be arrived at from the Overall Grade Point Average as stipulated in the following conversion Table.

Grade	Over all Grade Point Average(OGPA)	Over all weighted Average marks	Classification
0	9.0 to 10.0	90 to 100	First Class
A	8.0 to 8.9	80 to 89	First Class
B	7.0 to 7.9	70 to 79	First Class
C	6.0 to 6.9	60 to 69	First Class
D	5.0 to 5.9	50 to 59	Second Class
F	0.0 to 4.9	0 to 49	**Reappearance**

The Grade Sheets of successful candidates provide particulars such as (1) Overall weighted Average Marks and (2) Overall Grade.

11. Pattern of the Question Paper: The question paper for the End Assessment will be set for three hours and for a maximum of 100 marks with following divisions and details.

Part A: 10 questions (with equal distribution to all the units in the syllabus). Each question carries 2 marks.

Part B: 5 questions with either or type (with equal distribution to all the units in the syllabus). Each question carries 16 marks.

The total marks scored by the candidates will be calculated to the maximum prescribed in the Regulations.

12. Syllabus

109PMMT01 – TOPOLOGY

UNIT I :

Metric Space : Definition, examples and basic concepts. Sub-spaces and products. Open sets, Closed sets, Neighbourhoods, first and second countable spaces.

UNIT II :

Complete metric space, Cantor's intersection theorem, Baire category theorem, Completeness and contracting mappings, Banch fixed point theorem and its application, completion of a matric space, Isometry, Completion theorem.

UNIT III :

Topological spaces : Definition and basic concepts. Continuous fuction and Homomorphism of metric spaces and topological spaces, Urysohn's metrization theorem.

UNIT IV :

Separability, countability axims, separable spaces, product spaces, Quotient spaces, separation axioms, Urysohn's lemma, Tietze extension theorem.

UNIT V :

Compactness and local compactness, sequentially compactness and totally boundedness, connectedness and local connectedness. One point compactification of local compact Hausdorff spaces.

References:

1. Simmons G.F. : Introduction to Topology and Modern Analysis Mc-Graw Hill Book Co., N.Y. (1963)
2. Copson E.T. : Metric Spaces
3. P.K.Jain & K. Ahmed : Metric Spaces New Age International (P) Ltd., New Delhi (1995) (Reprint 1997) & John Wiley & Sons, New York (1995)
4. James R. Munkres : Topology Prentice Hall of India

109PMMT02 – COMPLEX ANALYSIS

UNIT I :

Geometric representation of complex numbers. Stereographic projections. Analytic function, Cauchy-Riemann equations, Harmonic functions, Elementary functions.

UNIT II :

Mobius transformation, Isogonal and conformal transformations, Geometrical inversion. The critical point, co-axial circles. Invariance of the cross-ratio, special Mobius transformation:
$w = z^n$, $w = \sqrt{z}$, $w = \tan^2\{(1/4\ \pi)\ \sqrt{z}\}$, $z = c \sin w$.

UNIT III :

Complex integration, Cauchy's theorem and integral formula, Poisson's integral formula, Derivatives of an analytic function, Taylor's theorem, Morera's theorem, Liouville's theorem, Laurent's theorem.

UNIT IV :

Zeros and singularities, Poles and Zeroes of Mermorphic functions, Rouche's theorem, The maximum modulus principle, Fundamental theorem. Theory of Residues, Analytical continuation.

UNIT V :

Entire functions-Mittag Leffler's theorem, The Weierstrass factorization theorem, The Jenson and Poisson-Jenson formulas, Hadmard's factorization theorem.

References :

1. Churchil & Brown: Complex Analysis, John Wiley & Sons Inc
2. J.B.Conway: Functions of One Complex Variable, Springer-Verlag, New York, 1973
3. H.A.Priestly: Introduction to Complex Analysis, Clarendo Press, Oxford, 1990
4. L.V.Ahlfors: Complex Analysis, 2nd Edition Mc-Graw Hill Co., New York, 1965

109PMMT03 – DIFFERENTIAL EQUATIONS

UNIT I :

Total Differential Equations, Series solutions of first and second order linear equations, Integration in series.

UNIT II :

The method of successive approximations, Picard's existence theorem, Existence and uniqueness of the solution of the equation $y' = f(x,y)$. Lipschitz condition. Linear dependence and independence of solutions of linear differential equations. Wronskian.

UNIT III :

Partial differential equations of the first order, Cauchy's problem for first order equation. Non-linear partial differential equation of first order, Charpit's method, Jacobi's method, Monge's method : Linear partial differential equations with constant coefficients, Equations with variable coefficient, Linear equations of the second order.

UNIT IV :

Two and three dimensional Laplace, Wave and Diffusion equations, Solution of the boundary value problems by the method of separation of variable.

UNIT V :

Linear difference equations with constant coefficient, Generating function technique, Matrix methods.

References :

1. I.N.Sneedon : Elements of Partial Differential Equations Mc-Graw Hill Book Company Inc., New York
2. S.Goldberg : Difference Equations, John Wiley & Sons Inc.

109PMMT04 – FLUID MECHANICS

UNIT I :

Lagrangian and Eulerian methods, Equation of continuity in fluid motion, Boundary surface, Euler's equation of motion for perfect fluid, Bernoulli's theorem.

UNIT II :

Two dimentional motion, Irrotational flows, Complex potential for various singularities, Images. Application of conformal mapping. Motion of a circular cylinder, Blasius's theorem.

UNIT III :

General motion of a fluid element, Stoke's theorem, Kelvin's circulation theorem, Kelvin's minimum energy theorem. Motion of a sphere in an infinite mass of liquid at rest at infinity, Ideal fluid flow around a sphere, concentric sphere (initial motion).

UNIT IV :

Stress-strain analysis, Constitutive equation, Navier-stokes equations, Buckingham's II- theorem, similitude, Non-dimensional parameters : Froude number, Pressure coefficient, Reynolds number, Grashof number, Prandtl number, Peclet number.

UNIT V :

Exact solutions : Laminar flow between parallel plates, Hagen-Poiseuille flow through a circular pipe (co-axial circular pipes, elliptic cross section, equilateral triangular section) Laminar flow between concentric rotating cylinders, steady motion of a various fluid due to a slowly rotating sphere, Flow in convergent and divergent channels, unsteady motion of flat plate, flow due to an oscillating flat plate, unsteady flow of viscous incompressible fluid between two parallel plates, Low Reynolds number solution : Flow past a sphere and circular cylinder.

References :

1. F. Chorlton: Fluid Dynamics
   D. Van Nostrand Com.Ltd.
2. Principles of Fluid Dynamics: M. K. Natrajan
   Oxford & IBH Publishing Co.
3. Hydrodynamics: H. Lamb
   Cambridge University Press
4. Hydrodynamics Vol.I & II: Basset A. B. Dover Publishing Inc.

209PMMT01 – ABSTRACT ALGEBRA

UNIT I :

Commutative rings, sub-rings, ideals. Prime ideals and maximal ideals.

UNIT II :

Primary decompositions, Rings of fractions. Commutative Noetherian rings.

UNIT III :

Modules. Chain conditions on modules.

UNIT IV :

Characteristic of a field, perfect fields, separability of extensions, normal extensions.

UNIT V :

Finite fields, primitive elements, algebraically closed fields, norms and traces.

References :

1. R.Y.Sharp : Steps in Commutative Algebra. Cambridge University Press, 1990.
2. P.J.McCarthy : Algebraic Extension of Fields Chelsea Publishing Company, New York, 1976.

209PMMT02 – LINEAR ALGEBRA

UNIT I :

Vector spaces, Subspaces, Bases, Dimension and coordinates of a vector space.

UNIT II :

The algebra of linear transformations, Isomorphism. Representation of transformations by matrices, Linear functional, Annihilators, the transpose of a linear transformation.

UNIT III :

Invariant, Direct cum decomposition, Characteristics values and Characteristics vectors, Diagonalizable operators, The primary decomposition theorem.

UNIT IV :

Inner product spaces, Linear functional and adjoints, Positive unitary and normal operators. The spectral theorem, Simultaneous diagonalization of normal operators.

UNIT V :

Bilinear forms, Symmetric bilinear forms, Skew Symmetric bilinear forms.

References :

1. K.Hoffman & R.Kunje : Linear Algebra (Ch 2, 3, 6 and 9) Prentice Hall of India.
2. P.R.Halmos : Finite Dimensional Vector Spaces

209PMMT03 – OPERATIONS RESEARCH

Unit I :

Inventory : Inventory models, Probabilistic models, Inventory models with price breaks.
Replacement : Replacement of items that deteriorate problems of choosing between two machines, Replacement of items that fail completely, Problems in mortality and staffing.

Unit II :

Waiting Lines : Queuing models property of Poisson, exponential and Erlangian processes, Steady state solution of queuing models : M/M/1. General single station queuing model M/M/S and M/E_k/1, simple numerical problems on these models.
Sequencing : Definition, Processing n jobs through two and three machines. 2 jobs through n machines (graphical method). The Travelling Salesman problem.

Unit III :

Allocation : Simplex, Assignment and Transportation problems of linear Programming. Computational methods of obtaining their optimal solution. Degeneracy in transportation problems.

Unit IV :

Theory of Games : Competitive strategies, competitive games, pure and mixed strategies, Rectangular games, Minimax criterion of optimality. Methods for solution of rectangular games and linear programming problem. Minimax theorem, Graphical method.

Unit V :

Dynamic Programming : Concept of dynamic programming. Problems with a finite number of consecutive decisions, relations between linear programming and dynamic programming. Mathematical formulation of dynamic programming. CPM/PERT techniques.

References :

1. H. A. Taha: Operations Research (An Introduction) Prentice Hall of India
2. Sasieni, Yaspan, Friedman: Operations Research John Wiley & Sons Inc.

209PMMT04 – COMPUTATIONAL NUMERICAL METHODS

Unit I :

Computer Arithmetic, Concept of truncation error, Round off error, Error propagation of numerical stability. Curve fitting and principle of least square.

Unit II :

Solution Of equation, Bisection, Iteration Method, Regula falsi & Newton Rephson method, The Comlex Root. Polynomial Interpolation, Difference Schemes, Newton & Hermite Formalae Of Interpolation.InterPolation Using Differences,

Unit III :

Runge-kutta, Eulars Picards Method, Milen's Method, Solution By Taylors Series, . Linear Equation, Gauss Elimination Method, LU-Decomposition, Jordan's & Court's Method

Unit IV :

Jacobi Method, Gauss-Sidal Method, Relaxation Method, Continuous frquency distribution, Graphical Representation, Regression & Regression Analysis.

Unit V :

Single step and Multi-step method of numerical solution of differnetial equations, Criterian of stability and consistency, convergence of a numerical method, Numberical solutions of Elliptic, Parabolic and Hyperbolic equations by finite difference technique.

Time Series & Test Of Significance, Student 't' Test, Chi- Square test, F-test, Variance Analysis.

Numerical Quadrature & error Estimation, Newton-Cote Formulae, Boole's Rule, Euler-Maclaurian Rules

References :

1. M.K.Jain: Numerical Methods for Scientific and Engineering Computation.
   S.R.K. Iyengar, R.K. Jain Wiley Eastern Ltd.
2. C.E.Froberg: Introduction to Numerical Analysis
   Addison – Wesley Pub. Company
3. S.S. Sastry: Introductory method to Numerical Analysis.
   Prentice Hall of India Numerical & Statistical
   Pundhir, Singh & Pundhir Techniques
   Pragati Prakashan Merrut.