

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

Sem	Pt I/ II/ III/ IV	Sub No.	Subject status	Subject Title	Hrs/ week	Cre dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext	Tot.	Ext.	Tot.
I	I	1	Language	TAMIL/OTHER LANGUAGE	6	3	25	75	100	30	40
	II	2	Language	ENGLISH	6	3	25	75	100	30	40
	III	3	Core - 1	CALCULUS	5	5	25	75	100	30	40
		4	Core - 2	CLASSICAL ALGEBRA	5	5	25	75	100	30	40
		5	Allied - I	PHYSICS / STATISTICS - I /CHEMISTRY	6	5	25	75	100	30	40
	IV	6	Common	ENVIRONMENTAL STUDIES	2	2	25	75	100	30	40
	Subtotal					30	23				

CALCULUS

- Unit I :** Radius of Curvature in Cartesian and polar Co-ordinates, Pedal Equation - Involute and evolute – chord of curvature
- Unit II** Asymptotes - singular points (Node, cusp, Conjugate Points)
- Unit III** Tracing of curves - Folium of Descarte's - Cycloid, Cardioid and Lemniscate of Bernoulli
- Unit IV** Properties of Definite Integral – Bernoulli's formula and Reduction Formulae – Double and Triple Integrals - Changing the order of integration - Jacobians and change of variables
- Unit V** Beta and Gamma functions – Application of Beta and Gamma Functions in evaluation of Double and Triple Integrals, Improper Integrals.

Text Book:

Narayanan S and T.K. Manickavasagam Pillai - Calculus Volume I (2004), Volume II (2004), S. Viswanathan Printer Pvt.Ltd.

Books for Reference :

1. Kandasamy P and K. Thilagavathi - Mathematics for B.Sc., Volume II – 2004, S. Chand & Co., New Delhi.
2. Apostol T.M. - Calculus, Vol. I (4th edition) John Wiley and Sons, Inc., New York 1991.
3. Apostol T.M. - Calculus, Vol. II (2nd edition) John Wiley and Sons, Inc., New York 1969)
4. Stewart, J - Single Variable Calculus (4th edition) Brooks / Cole, Cengage Learning 2010.

CLASSICAL ALGEBRA

- Unit I** Theory of Equations – Formation of equations – Relation between roots and coefficients – symmetric function of the roots.
- Unit II** Sum of the powers of the roots of an equation – Newton’s theorem, Reciprocal Equations.
- Unit III** Transformation of equations, Descarte’s rule of signs – Rolle’s theorem
- Unit IV** Multiple roots, Sturm’s Theorem, solving appropriate solution of equations using Newton’s and Horner’s method.
- Unit V** Biquadratic equations – solution by Ferrari’s method – cubic equations – solutions by Cardon’s method.

Text Book:

Manickavasagam Pillai .T.K and S. Narayanan - Algebra – Viswanathan Publishers and Printers Pvt. Ltd., - 2004.

Books for Reference :

1. Kandasamy P and K. Thilagavathi - Mathematics for B.Sc., - 2004, Volume I and Volume IV, S. Chand & Co., New Delhi.
2. Arumugam .S, Thangapandi Issac – Classical Algebra, New Gamma Publishing House, Palayamkottai.
3. Burnside, W.S. and A.W. Panton - The Theory of Equations, Dublin University Press, 1954.
4. MacDuffee, C.C. - Theory of Equations, John Wiley & Sons Inc., 1954.

(For Mathematics Students)

Statistics – I

- Unit I** Moments, Skewness and Kurtosis - Curve fitting - method of least squares – Fitting lines – Parabolic, Exponential and Logarithmic curves.
- Unit II** Correlation and Regression – Scatter Diagram – Karl Pearson’s coefficient of correlation – Properties – Lines of Regression – Coefficient of Regression and properties – Rank Correlation.
- Unit III** Association of Attributes – Consistency of data – criteria for independence – Yule’s coefficient of Association.
- Unit IV** Random variable – Distribution function – properties of Distribution function – Mathematical Expectation – Addition theorem of Expectation – Multiplication theorem of Expectation – Moment generating function – cumulants – characteristic function – Properties of characteristic function.
- Unit V** Discrete and continuous Probability Distributions - Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution – Standard normal distribution and their properties – simple problems.

Text Book:

Gupta .S.C and V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

1. Vittal, V.R. – Mathematical Statistics (2004) Maragatham Publications
2. D.C. Sancheti&Kapoor – Statistics
3. M.L. Khanna – Statistics
4. S. Arumugam& others – Statistics

**Allied Mathematics
(For Science Students)**

Paper – I

Algebra and Differential Equations

- Unit I** Theory of Equations – Formation of Equations – Relation between roots and coefficients – Reciprocal equations.
- Unit II** Transformation of Equations – Approximate solutions to equations – Newton’s method and Horner’s method.
- Unit III** Matrices – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple problems.
- Unit IV** Differential equation of first order but of higher degree – Equations solvable for p , x , y – Partial differential equations – formations – solutions – Standard form $P_p + Q_q = R$.
- Unit V** Laplace transformation – Inverse Laplace transform.

Text Book:

Dr. S. Arumugam & others – Allied Mathematics – I

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UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

Sem.	Pt. I/II/III/IV	Sub. No.	Subject status	Subject Title	Hrs./ week	Credits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
II	I	7	Language	TAMIL/OTHER LANGUAGE	6	3	25	75	100	30	40
	II	8	Language	ENGLISH	6	3	25	75	100	30	40
	III	9	Core - 3	ANALYTICAL GEOMETRY	5	5	25	75	100	30	40
	III	10	Core - 4	DIFFERENTIAL EQUATIONS	5	5	25	75	100	30	40
	III	11	Allied – II (Theory)	PHYSICS/ STATISTICS-II / CHEMISTRY	6	5	25	75	100	30	40
			For other UG Programme	Mathematics-VECTOR CALCULUS & FOURIER SERIES (For Science Students)							
For the current UG Programme			STATISTICS –II (For Mathematics Students)								
IV	12	Common	VALUE BASED EDUCATION/ சமூக ஒழுக்கங்களும் பண்பாட்டு விழுமியங்களும்/ SOCIAL HARMONY	2	2	25	75	100	30	40	
Subtotal					30	23					

ANALYTICAL GEOMETRY

- Unit I** Analytical Geometry of 2D Polar co-ordinates. Distance between the points – Area of Triangle – Equation of straight line.
- Unit II** Circle and conics – simple problems involving chords tangents and normals.
- Unit III** Analytical Geometry of 3D Co-ordinate system, direction cosines, direction ratios - Equation of planes in different forms - angle between planes. Equation of a line - image of a point – image of a line.
- Unit IV** Sphere – Tangent plane – circle of intersections – Tangency of Spheres – coaxial system of spheres - Radical Planes – Orthogonal Spheres.
- Unit V** Equation of a cone-cone with vertex at the origin – Quadratic cone with the vertex at origin – Right circular cone – Cylinder – Right circular cylinder.

Text Book:

1. Duraipandian .P. Laxmi Duraipandian and D. Muhilan - Analytical Geometry of Two Dimension - Emerald Publishers
2. Duraipandian .P. Laxmi Duraipandian and D.Muhilan - Analytical Geometry of Three Dimension - Emerald Publishers.

Books for Reference :

1. Kandasamy .P. and K. Thilagavathi – Mathematics for B.Sc., Vol. IV – 2004 S.Chand and Co. New Delhi.
2. Loney .S.L. - The Elements of Coordinate Geometry - Mcmillan and Company London.
3. Bill .R.J.T - Elementry Treatise on Coordinate Geometry of Three Dimensions - Mcmillan India Ltd., 1994.
4. B. Stephen John - Analytical Geometry of 3D and vector differentiation : IDEAL publication.

DIFFERENTIAL EQUATIONS

- Unit I** First order higher degree equations – solvable for x, y, p and Clairaut's form – Simultaneous differential equations of the form $f_1(D)x + g_1(D)y = h_1(t)$, $f_2(D)x + g_2(D)y = h_2(t)$
- Unit II (Ordinary differential equation)**
Second order linear differential equations with constant coefficients – Find the P.I for functions of the form $e^{ax} f(x)$ and $x^n f(x)$
- Unit III** Linear equations of second order with variable coefficients – Homogeneous equations – Equation reducible to homogeneous equation.
- Unit IV (Partial differential equations)**
Formation of equations by elimination of arbitrary constants and functions – Definition of general, particular and complete solutions – solving standard forms $f(p, q) = 0$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$, $f(x, p) = f(y, q)$, $z = px + qy + f(p, q)$ – Lagrange's differential equations $P_p + Q_q = R$
- Unit V** Application of differential equations – Growth and Decay – chemical reaction - Newton's law of cooling – Brochistocrone problem – simple electric circuits.

Text Book:

1. Narayanan .S and T.K. Manickavachagam Pillai – Differential equations and its applications, 2003 - S. Viswanathan Printers.

Books for Reference :

- 1 Kandasamy .P and K. Thilagavathi - Mathematics for B.Sc., Vol. III – 2004 – S.Chand and Co., New Delhi.
- 2 Braun .M. - Differential Equations and their applications (III edition) Springer – Verlag, New York 1983)
- 3 Boyce .W.E and R.C. Diprima – Elementary differential equations and Boundary value Problems (VII editions) - John Wiley and Sons, Inc, New York 2001.
- 4 Sankaranarayan and Manguldoss – Differential Equations.

(For Mathematics Students)

Statistics – II

Unit I Characteristics of index numbers – Laspeyer’s and Paasche’s – Fisher’s and Bowley’s Marshall and Edgeworth’s index numbers – Tests – Unit test, Commodity Reversal test, Time Reversal test, circular test.

Unit II Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors - Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions. Testing a single mean and Difference of means.

Unit III Tests based on t-distribution – single mean and Difference of means – Tests based on F-distribution – Variance Ratio test – Tests based on Chi-square Distribution – Independence – Goodness of fit.

Unit IV Analysis of variance – one way and two way classified data – Basis of experimental design – Randomized Block Design – Latin square – simple problems.

Unit V Statistical Quality control – Definition – Advantages, Process control – Control chart, Mean chart, Range chart, P-chart, Product Control – Sampling Inspection Plans.

Text Book:

1. Gupta .S.C & V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

1. Vittal .P.R – Mathematical Statistic (2004) – Maragatham Publications
2. DC Sancheti & Kapoor – Statistics
3. M.L. Khanna – Statistics
4. S. Arumugam & others – Statistics

**Allied Mathematics
(For Science Students)**

Vector Calculus & Fourier Series

- Unit I** Vector differentiation – Gradient – Divergence and curl
- Unit II** Evaluation of double and triple integrals
- Unit III** Vector integration – Line, surface and volume integrals
- Unit IV** Green's, Stokes and Divergence theorems (without proof) – simple problems.
- Unit V** Fourier series – Even and odd functions – Half range Fourier series.

Text Books

1. Dr. S. Arumugam & others – Allied Mathematics II

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UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

(44th SCAA meeting held on 30.05.2016)

Sem.	Pt. I/II/III I/ IV/V	Sub No.	Subject status	Subject Title	Hrs./ week	Cre- dits	Marks					
							Maximum			Passing minimum		
							Int	Ext.	Tot.	Ext.	Tot.	
III	I	13	Language	Tamil/Other Language	6	3	25	75	100	30	40	
	II	14	Language	English	6	3	25	75	100	30	40	
	III	15	Core - 5	REAL ANALYSIS - I	6	5	25	75	100	30	40	
		16	Allied – III	STATISTICS -I / PHYSICS/ CHEMISTRY	6	5	25	75	100	30	40	
				For Other UG Programme								Mathematics – ALGEBRA AND DIFFERENTIAL EQUATIONS (For Science Students)
				For the Current UG Programme								STATISTICS –I (For Mathematics Students)
	IV	17	Skilled Based Subject -I	VECTOR CALCULUS	4	4	25	75	100	30	40	
IV	18	Non-Major Elective –I (any one of the following)	(A) MATHEMATICS FOR COMPETITIVE EXAMINATIONS- I (or) (B)FUNDAMENTALS OF STATISTICS - I	2	2	25	75	100	30	40		
Subtotal					30	22						

Sem.	Pt. I/II/II I/ IV/V	Sub No.	Subject status	Subject Title	Hrs./ week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int	Ext.	Tot.	Ext.	Tot.
IV	I	19	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	20	Language	English	6	3	25	75	100	30	40
	III	21	Core - 6	ABSTRACT ALGEBRA	6	5	25	75	100	30	40
		22	Allied - IV	STATISTICS -II/ PHYSICS/ CHEMISTRY	6	5	25	75	100	30	40
			For Other UG Programme	Mathematics – VECTOR CALCULUS & FOURIER SERIES (For Science Students)							
			For the Current UG Programme	STATISTICS –II (For Mathematics Students)							
	IV	23	Skilled Based Subject -II	TRIGONOMETRY, LAPLACE TRANSFORMS AND FOURIER SERIES	4	4	25	75	100	30	40
	IV	24	Non-Major Elective –II (any one of the following)	(A) MATHEMATICS FOR COMPETITIVE EXAMINATIONS-II (or) (B)FUNDAMENTALS OF STATISTICS - II	2	2	25	75	100	30	40
	V		Extension Activity	NCC, NSS, YRC, YWF		1					
Subtotal					30	23					

**MSU/2016-17/UG-Colleges /Part-III (B.Sc. Mathematics)/
Semester-III /Ppr.no.15/ Core-5**

REAL ANALYSIS - I

- Unit I** **Real number system :**
The field of axioms, the order axioms, the rational numbers, the irrational numbers, upper bounds, maximum element, least upper bound (supremum). The completeness axiom, absolute values, the triangle inequality. Cauchy – schwartz's inequality.
- Unit II** **Sequences :** Bounded sequences – monotonic sequences – convergent sequences – divergent and oscillating sequences – The algebra of limits.
- Unit III** Behaviour of monotonic sequences – Cauchy's first limit theorem – Cauchy's second limit theorem – Cesaro's theorem – subsequences - Cauchy sequence – Cauchy's general principle of convergence.
- Unit IV** Series : Infinite series – n^{th} term test – Comparison test – Kummer's test – D'Alembert's ratio test – Raabe's test - Gauss test – Root test – Cauchy's condensation test (without proof)
- Unit V** Alternating series – Leibnitz's test - Tests for convergence of series of arbitrary terms – Power series – Taylor's series – Maclaurin's series.

Text Books:

- Arumugam .S and Thengapandi Issac – “sequences and series”, New Gamma publishing House, Palayamkottai – 627 002.
- Tom M. Apostol – Mathematical Analysis, II Edition, Narosa Publishing House, New Delhi (unit I)

Book for Reference :

- Goldberg .R – Methods of Real Analysis, Oxford and IBH Publishing Co., New Delhi.

**MSU/2016-17/UG-Colleges/ Part-III (B.Sc. Mathematics)/Semester-III/
Ppr.no.16 (A)/Allied - III**

**Allied Statistics
(For Mathematics Students)**

Statistics – I

- Unit I** Moments, Skewness and Kurtosis - Curve fitting - method of least squares – Fitting lines – Parabolic, Exponential and Logarithmic curves.
- Unit II** Correlation and Regression – Scatter Diagram – Karl Pearson’s coefficient of correlation – Properties – Lines of Regression – Coefficient of Regression and properties – Rank Correlation.
- Unit III** Association of Attributes – Consistency of data – criteria for independence – Yule’s coefficient of Association.
- Unit IV** Random variable – Distribution function – properties of Distribution function – Mathematical Expectation – Addition theorem of Expectation – Multiplication theorem of Expectation – Moment generating function – cumulants – characteristic function – Properties of characteristic function.
- Unit V** Discrete and continuous Probability Distributions - Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution – Standard normal distribution and their properties – simple problems.

Books for Reference :

1. Gupta .S.C and V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.
2. Vittal, V.R. – Mathematical Statistics (2004) Maragatham Publications
3. D.C. Sancheti & Kapoor – Statistics
4. M.L. Khanna – Statistics
5. S. Arumugam & others – Statistics

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics) /
Semester-III/ Ppr.no.16 (B)/Allied -III**

(For Science Students)

Algebra and Differential Equations

- Unit I** Theory of Equations – Formation of Equations – Relation between roots and coefficients – Reciprocal equations.
- Unit II** Transformation of Equations – Approximate solutions to equations – Newton’s method and Horner’s method.
- Unit III** Matrices – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple problems.
- Unit IV** Differential equation of first order but of higher degree – Equations solvable for p , x , y – Partial differential equations – formations – solutions – Standard form $P_p + Q_q = R$.
- Unit V** Laplace transformation – Inverse Laplace transform.

Books for Reference :

1. Dr. S. Arumugam & others – Allied Mathematics – I

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics)/
Semester -III/Ppr.no.17/Skilled Based -I**

VECTOR CALCULUS

- Unit I** Vector point functions – Scalar point functions – Derivative of a Vector & Derivative of sum of vectors – Derivative of product of a Scalar and Vector point function – The vector operator ‘del’ - Gradient
- Unit II** Divergence – Curl, solenoidal, irrotational vectors – Laplacian operator.
- Unit III** Integration of point function – Line integral – Surface integral,
- Unit IV** Volume integral – Gauss divergence theorem (statement only) – Problems.
- Unit V** Greens theorem and Stoke’s theorem (statements only) – problems.

Text Book:

- Durai Pandian .P and Laxmi Durai Pandian – Vector Analysis (Revised Edition – Reprint 2005) Emerald Publishers.

Books for Reference :

- Dr. S. Arumugam and others – Vector Calculus, New Gamma Publishing House.
- Susan .J.C - Vector Calculus, (4th Edn.) Pearson Education, Boston 2012.
- Anil Kumar Sharma, - Text book of Vector Calculus, Discovery Publishing House, 1993.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-III/ Ppr.no.18(A)/Non Major Elective –I (A)**

Mathematics for Competitive Examinations -I

Unit I Simplifications, averages

Unit II Ratio and proportion

Unit III Partnership - Percentage

Unit IV Profit and Loss

Unit V Problems on numbers

Books for Reference :

1. Objective Arithmetic – R.S. Aggarwal – S.Chand & Co.
2. Quantitative Aptitude for Competitive examinations – Abhijit Guha – TMH
3. Mathematics for life – M. Immaculate – Nanjil offset Printers

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-III/ Ppr.no.18 (B)/Non Major Elective –I (B)**

Fundamentals of Statistics - I

- Unit I** Classification of datas – Bar diagram – Pie chart
- Unit II** Measures of Central tendency : Mean, median, mode (with frequency)
- Unit III** Measures of dispersion : Range – standard deviation, variance – Quartile deviation.
- Unit IV** Correlation – rank correlation (Problems only)
- Unit V** Regression equations (Problem only)

Books for Reference :

1. S.P. Gupta – Statistics
2. Dr. S. Arumugam – Statistics
3. M.L. Khanna – Statistics

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics)/
Semester -IV/Ppr.no.21/Core -6**

ABSTRACT ALGEBRA

- Unit I** Groups – definition and Examples – Subgroup – order of an element – centre of a group – Normalizer and centralizer. Product of two subgroups – order of HK – Intersection and union of subgroups.
- Unit II** Cyclic groups – generators of a cyclic group – Number of generators of a cyclic groups – Cosets – Partitioning of a group by Cosets – Lagrange’s theorem – Euler’s theorem – Fermat’s theorem.
- Unit III** **Normal subgroups** : Quotient groups – Group Homomorphis – Canonical homomorphism – kernel of a homomorphism – Isomorphism – Automorphism – Inner automorphism – Permutation groups – Cayley’s theorem.
- Unit IV** **Rings:** Definition and examples – Types of rings – Elementary properties of a ring – Integral domain – Field – Sub rings – Subfields – Ideals – Principal ideal – quotient ring – Maximal and prime ideals - characteristic of a ring – PID – UFD.
- Unit V** Homomorphism of rings – Isomorphism – kernel of a homomorphism – Fundamental theorem – Field of quotients of an integral domain – polynomial rings – Division algorithm

Text Book:

- Arumugam .S and Tangapandi Issac .A – “Modern Algebra”scitech publications Pvt. Ltd.

Books for Reference :

- Anton .H and C. Rorres - Elementary Linear Algebra (9th Edn) John Wiley and Sons, Inc., New York 2005.
- Manicavasagam Pillai .T.K and others – Modern Algebra, S. Viswanathan Publishers, Chennai 1993.
- Herstein .I.N – Topics in Algebra, Vikas Publishing Pvt. Ltd. 1975, New Delhi.

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics) /
Semester-IV/Ppr.no.22(A)/Allied -IV**

(For Mathematics Students)

Statistics – II

- Unit I** Characteristics of index numbers – Laspeyer’s and Paasche’s – Fisher’s and Bowley’s Marshall and Edgeworth’s index numbers – Tests – Unit test, Commodity Reversal test, Time Reversal test, circular test.
- Unit II** Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors - Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions. Testing a single mean and Difference of means.
- Unit III** Tests based on t-distribution – single mean and Difference of means – Tests based on F-distribution – Variance Ratio test – Tests based on Chi-square Distribution – Independence – Goodness of fit.
- Unit IV** Analysis of variance – one way and two way classified data – Basis of experimental design – Randomized Block Design – Latin square – simple problems.
- Unit V** Statistical Quality control – Definition – Advantages, Process control – Control chart, Mean chart, Range chart, P-chart, Product Control – Sampling Inspection Plans.

Books for Reference :

1. Gupta .S.C & V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.
2. Vittal .P.R – Mathematical Statistic (2004) – Maragatham Publications
3. DC Sancheti & Kapoor – Statistics
4. M.L. Khanna – Statistics
5. S. Arumugam & others – Statistics

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics) /
Semester-IV/Ppr.no.22(B)/Allied -IV**

(For Science Students)

Vector Calculus & Fourier Series

- Unit I** Vector differentiation – Gradient – Divergence and curl
- Unit II** Evaluation of double and triple integrals
- Unit III** Vector integration – Line, surface and volume integrals
- Unit IV** Green's, Stokes and Divergence theorems (without proof) – simple problems.
- Unit V** Fourier series – Even and odd functions – Half range Fourier series.

Books for Reference :

1. Dr. S. Arumugam & others – Vector Calculus
2. T.K. Manicavachagom Pillai – Calculus (Vol II)

**MSU/2016-17/UG-Colleges/Part-III (B.Sc. Mathematics) /
Semester-IV/Ppr.no.23/Skilled Based -II**

TRIGONOMETRY, LAPLACE TRANSFORMS AND FOURIER SERIES

Unit I Trigonometry : Expansions of $\sin nx$, $\cos nx$, $\tan nx$ and expansions of $\sin^n x$ & $\cos^n x$.

Unit II Hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions – Logarithm of complex numbers – Summation of series by $C + iS$ method.

Unit III Laplace Transforms – Inverse Laplace Transforms.

Unit IV Solving linear differential equations with constant coefficients and simultaneous equations using Laplace Transforms.

Unit V Fourier Series – Definition - Finding Fourier coefficients for a given periodic function with period 2π and $2l$ – Odd and even functions – Half range series.

Text Books:

Arumugam .S and Tangapandi Issac .A -Trigonometry and Fourier Series

Manichavasagam Pillai, T.K., and S. Narayanan-Differential Equations and its Applications

Books for Reference :

- Manichavasagam Pillai, T.K., and S. Narayanan, - Trigonometry, Viswanathan Publishers and Printers Pvt. Ltd.
- Loney - Trigonometry.
- Robert T. Seeley - Fourier Series and Integrals, Dover Publications, New York, 2006.
- Ray Hanna J., - Fourier Series, Transforms and Boundary Value Problems, Dover Publications, New York, 2008.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-IV/ Ppr.no.24(A)/Non Major Elective –II (A)**

Mathematics for Competitive Examinations -II

Unit I Simple Interest – Compound interest

Unit II Time and work

Unit III Time and distance

Unit IV Chain Rule

Unit V Pipes and Cistern

Books for Reference :

1. Objective Arithmetic – R.S. Aggarwal
2. Descriptive Mathematics - R.S. Aggarwal, Deepak Aggarwal
3. Mathematics for life – M. Immaculate – Nanjil offset Printers

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-IV/Ppr.no.24(B)/Non Major Elective -II (B)**

Fundamentals of Statistics - II

- Unit I** Theory of attributes for two attributes (simple problems)
- Unit II** Characteristics of index numbers – Laspeyer’s and Paasche’s
- Unit III** Bowley’s – Marshall index numbers
- Unit IV** Fisher’s index number – Time Reversal test (Problems only)
- Unit V** Fitting a straight line

Books for Reference :

1. S.P. Gupta – Statistics
2. Dr. S. Arumugam – Statistics
3. M.L. Khanna – Statistics

MANONMANIAM SUNDARANAR UNIVERSITY

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UG COURSES – AFFILIATED COLLEGES

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(44th SCAA meeting held on 30.05.2016)

V	I	25	Core - 7	Real Analysis –II	7	5	25	75	100	30	40
	II	26	Core - 8	Mechanics	7	5	25	75	100	30	40
	III	27	Major Elective-I	A) Numerical Methods B) Astronomy – I C) Discrete Mathematics	6	5	25	75	100	30	40
		28	Major Elective-II	A) Combinatorial Mathematics B) Operations Research C) Coding Theory	6	5	25	75	100	30	40
	IV	29	Skilled Based subject (Common)	Personality Development/ Effective Communication/ Youth Leadership	4	4	25	75	100	30	40
				Subtotal	30	24					
VI	I	30	Core - 9	Abstract algebra –II	6	5	25	75	100	30	40
	II	31	Core - 10	Complex Analysis	6	5	25	75	100	30	40
	III	32	Core – 11	Number Theory	6	5	25	75	100	30	40
		33	Core - 12	Graph Theory	6	5	25	75	100	30	40
	IV	34	Major Elective-III	A) Fuzzy Mathematics – I B) Astronomy – II C) Mathematics Modelling	6	5	25	75	100	30	40
				Subtotal	30	25					

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Core - 7**

REAL ANALYSIS - II (105 Hours) (JMMA52)

- Unit I** Metric spaces – Examples – bounded sets – open ball – open sets – subspaces – Interior of a set.
- Unit II** Closed sets – closure – Limit points – Dense sets – complete metric space – Cantor’s intersection theorem – Baire’s Category Theorem.
- Unit III** Continuous functions on metric spaces : Functions - continuous at a point on the real line – Functions - Continuous – uniform continuous in a metric space – Discontinuous function on \mathbb{R}^1 .
- Unit IV** Connectedness and compactness : Connectedness – connected subset of \mathbb{R} – connectedness and continuity – compact metric spaces – compact subset of \mathbb{R}^1 – Heine Borel theorem.
- Unit V** **Riemann Integral :**
Sets of measure zero – Existence of the Riemann integral – Derivatives – Rolle’s theorem – Fundamental theorem of Calculus – Mean value theorem – Cauchy’s mean value theorem – Taylor’s theorem.

Text Books:

Arumugam & Others – Modern Analysis

- * Malic .S.C – Mathematical Analysis, Wiley Eastern Limited, New Delhi.

Books for Reference :

1. Tom .M. Apostol – Mathematical Analysis, II Edition, Narosa Publishing House, New Delhi (Unit I) (1997)
2. Goldberg .R – Methods of Real Analysis Oxford and IBH Publishing Co. New Delhi (200)
3. Viswanath Naik .K – Real Analysis, Emerald Publishers, Chennai.
4. Malic .S.C and Savitha Arora (1991) - Mathematical Analysis, Wiley Eastern Limited, New Delhi.
5. Berberian .S.K – First course in Real Analysis, Springer Verlag, New York.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Core - 8**

MECHANICS (90 Hours) (JMMA53)

- Unit I** **Forces acting at a point :** Forces acting at a point – types of forces – Triangle of forces – Polygon of forces – Lami’s theorem – Parallel Forces and moments – Resultant of two like parallel forces, unlike and unequal parallel forces – moment of a force – Varignon’s theorem of moments.
- Unit II** **Equilibrium of Strings and Chains :** Equilibrium of strings and chains – Common catenary – Suspension bridge.
- Unit III** **Projectiles :** Projectiles : Equation of Path – Maximum height – Time of flight – Range.
- Unit IV** **Simple Harmonic Motion :** Simple harmonic motion (SHM) in a straight line – Geometrical representation – Composition of SHM’s of same period in the same line and along two perpendicular direction – SHM as a curve – Simple pendulum – Simple equivalent pendulum. The seconds pendulum.
- Unit V** **Motion under the action of Central Forces :** Velocity and acceleration in Polar co-ordinates – Differential equation of Central Orbit – Pedal equation of Central Orbit.

Text Books :

- Venkataraman .M.K., - Statics, Agastiar Publications 2002, Trichy.
- Venkataraman .M.K, -A text book on Dynamics, 2001, Agastiar Publications, Trichy.

Books for Reference :

1. Venkataraman .M.K., - Statics, Agastiar Publications 2002, Trichy.
2. Venkataraman .M.K, - A text book on Dynamics, 2001, Agastiar Publications, Trichy.
3. Duraipandian .P, Laxmi Duraipandian and Muthumizh Jayapragasam, Mechanics, 2003, S.Chand and Company.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – I (A)**

NUMERICAL METHODS

- Unit I** Solution of Numerical algebraic and Transcendental Equations : bisection method – Newton’s method. Criterion of order of convergence of Newton’s method. Regula False method – Gauss elimination – Gauss Jacobi – Gauss Seidal method
- Unit II** **Finite Difference** : First and higher order differences – Forward and backward differences – Properties of Operator – Differences of a polynomial –Factorial polynomial – Error propagation operator E and E^{-1} . Relation among Δ , E, δ and D
- Unit III** Interpolation : Newton’s Forward – backward, Gauss forward – backward interpolation formula – Bessel’s formula. Divided differences – Newton’s divided difference formula – Legrange’s interpolation formulè – Inverse interpolation formula.
- Unit IV** Numerical Differentation and Integration : Newtons forward and backward differences for differentiation – Derivatives using Bessel’s formula – Trapezoidal rule, simpson’s 1/3 rule & 3/8 rule – Weddle’s rule.
- Unit V** **Difference Equations** : Definition – order and degree of difference equation – Linear difference equation – Finding complementary function – particular Integral – simple applications.

Text Books :

- Venkataraman .M.L – Numerical methods in Science and Engineering National Publishing Company V Edition 1998.

Books for Reference :

1. Kandasamy .P.K. Thilagavathy and K. Gunavathy ‘Numerical Methods’ S. Chand & Company Ltd. Edn. 2006.
2. B. Stephen John – Numerical Analysis
3. Venkatraman .M.L - Numerical methods in Science and Engineering National Publishing Company V Edition 1998.
4. Autar Kaw and Egwwn Enc Kalu - Numerical methods with Application Abidet. Autokaw.com 2nd 2011.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – I (B)**

ASTRONOMY - I

- Unit I** **Spherical Trigonometry**
Spherical triangle – The fundamental formula of Spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems.
- Unit II** **The celestial sphere**
Celestial co-ordinates – Diurnal motion – Rising and setting of a star – sidereal time – circumpolar stars – Morning and evening stars - Twilight.
- Unit III** Earth – length of a day – Refraction – Tangent formula – Cassini’s formula – Effects of refraction
- Unit IV** Geocentric parallax – Effects – Heliocentric parallax – Effects – Aberration - Effects
- Unit V** Kepler’s laws – verification of Kepler’s laws – True anomaly, mean anomaly, Eccentric anomaly – Relation between them.

Text Books :

- Kumaravelu .S and Susheela Kumaravelu – Astronomy for degree classes, Rainbow Printers, Nagercoil (2005).

Books for Reference :

1. Ramachandran .G.V - Astronomy

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – I (C)**

DISCRETE MATHEMATICS

- Unit I (Mathematical logic)** Statement and notation – Connectives – Negation – Conjunction – Disjunctions – Statement formula and truth table – conditional and Biconditional – Well defined formulae – Tautologies – Equivalence of formulae – Quality laws – Normal forms.
- Unit II (Algebraic Structures)**
Groups and Monoids – Simple properties – group codes.
- Unit III (Lattices and Boolean algebra)**
Lattices and Posets – Properties of lattices – special lattices – Boolean algebra – Gating networks – Minimal sums of products – Karnaugh maps.
- Unit IV (Languages)**
Finite state Machines language – the set theory and strings – Finite state machine – A first encounter – Finite state machine – second encounter.
- Unit V (Number system and codes)**
Decimal, Binary, octal, Hexadecimal – Conversion from one to another – Binary addition, subtraction multiplication and division – BCD – weighted excess time – Gray code – ASCII Code,

Text Book:

- Tremblay and Manohar – Discrete Mathematical Structures with application to Computer Science, (Tata McGraw Hill, New Delhi) 1997.

Books for Reference :

1. Ralph P. Grumaldi Pearson Edelen – Discrete and Combinatorial Mathematics – an applied Introduction (IV edition)
2. Maluino .A and Leech – Digital Principles and Application Mcgrahill.
3. Venkataraman .M.K. and others – Discrete mathematics 2000 The National Publishing Company.
4. Balaji .G – Discrete Mathematics – Balaji Publishers, Chennai (2013)
5. Veerarajan .T – Discrete mathematics – Tata McGraw Hill – (2009)

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – II (A)**

Combinatorial Mathematics

- Unit I** Selections and Binomial coefficients – Permutations – Ordered Selections – Unordered Selections – Miscellaneous Problems.
- Unit II** Pairings Problems - Pairings within a set – Pairings between sets – An optional assignment problem.
- Unit III** Recurrence – Fibonacci – type relations. Using generating functions – Miscellaneous methods.
- Unit IV** The inclusion – Exclusion Principles – The Principle – Rook Polynomials
- Unit V** Block designs – Square Block designs

Text Books :

1. Ian Andersen – A first course in combinatorial Mathematics – Clarendon Press, Oxford.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – II (B)**

Operations Research

- Unit I** **Linear Programming Problem** : Mathematical formulation of LPP – Simplex Method – Artificial variable technique – Concept of Duality – Primal and Dual Problems – Duality – Dual Simplex Method.
- Unit II** **Transportation Problem** : North-West Corner Rule – Matrix Minima method – Vogel’s Approximation Method – MODI Method – Degeneracy and Unbalanced Transportation Problem.
- Assignment Problem** : Hungarian Method – Unbalance Assignment Problem
- Unit III** **Games and Strategies** : Two Person Zero sum Games – The Maximin – Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of 2 x n and m x 2 games – Dominance Property.
- Unit IV** **Network scheduling by PERT / CPM** : Network and basic components – Rules of Network Construction – Time Calculation in network – Critical Path Method – PERT Calculation.
- Unit V** **Inventory Control** : Introductions – Types of Inventories – Inventory decisions – Deterministic inventory Problem – EOQ problems with shortages.

Text Book:

- KantiSwarup, P.K. Gupta and Manmohan – Operations Research – Sultan Chand & Sons – 2006, 12th edition.

Books for Reference :

1. Gupta .P.K and D.S. Hira – Operations Research – S. Chand and Company.
2. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali - Linear Programming and Network Flows, 2nd Ed., John Wiley and Sons, India, 2004.
3. Hillier, F.S. and G.J. Lieberman - Introduction to Operations Research, 9th Ed., Tata McGrawHill, Singapore, 2009.
4. Hamdy A. Taha, - Operations Research, An Introduction, 8th Ed., Prentice – Hall India, 2006.
5. Hadley .G. - Linear Programming, Narosa Publishing House, New Delhi, 2002.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-V/ Major Elective – II (C)**

Coding Theory

- Unit I** Basic assumptions – Correcting and detecting error patterns – information rate – effects of error correction and detection – finding the most likely code word transmitted.
- Unit II** Linear codes – two important – subspaces independence – basic, dimension – matrices – Bases for C and C^+ generating matrices on coding.
- Unit III** Parity check matrices – equivalent codes – distance of a linear code – Linear codes – cosets – MLD for linear codes – Reliability of IMLD for linear codes.
- Unit IV** Some bounds for codes – perfect codes – hamming codes – extended codes – The extended Golay code – decoding the extended Golay code – Golay code.
- Unit V** Polynomials and words – introduction to cyclic codes – introduction to cyclic codes – Polynomial encoding and decoding – finding cyclic codes – Dual cyclic codes.

Text Book :

1. Coding theory, the essentials – Marcel Dekker, Inc. Madtrison Avenue, Newyork.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Core - 9**

ABSTRACT ALGEBRA II (105 Hours) (JMMA51)

- Unit I** **Vector Spaces** : Definition and examples – elementary properties – subspaces – linear transformation – fundamental theorem of homomorphism.
- Unit II** Span of a set – linear dependence and independence – basis and dimension - theorems
- Unit III** Rank and nullity Theorem – matrix of a linear transformation
Inner product space : Definition and examples – orthogonality – orthogonal complement – Gram Schmidt orthogonalisation process.
- Unit IV** **Matrices** : Elementary transformation – inverse – rank – test for consistency – solving linear equations.
- Unit V** Cayley Hamilton theorem – Applications of Cayley Hamilton theorem – Eigen values and Eigen vectors – Properties and problems.

Text Book: Arumugam & others – Modern Algebra

Books for Reference :

1. Shama .J.N and Vashistha .A.R, “Linear Algebra”, Krishna Prakash Nandir, 1981.
2. John B. Fraleigh, “A First Course in Abstract Algebra”, 7th edition, Pearson, 2002.
3. Strang G., “Introduction to Linear Algebra”, 4th edition, Wellesly Cambridge Press, Wellesly, 2009.
4. Artin M., “Abstract Algebra”, 2nd edition, Pearson, 2011.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Core - 10**

COMPLEX ANALYSIS

Unit I (Analytic functions)

Functions of a complex variable – Derivatives – Cauchy – Riemann equations – sufficient conditions – Polar form – Analytic functions – Harmonic functions.

Unit II (Integrals)

Definite integrals – Contours – Cauchy – Goursat theorem – antiderivatives and independence of path – Cauchy Integral formula – Morera's theorem.

Unit III (Series)

Taylor's series – Examples – Laurent's series – Zeros of analytic functions – Residues – Residue theorem – Principal part of functions – Residues at poles.

Unit IV (Evaluation of Integrals)

Evaluation of improper real integrals – improper integrals involving sines and cosines – Definite integrals involving sines and cosines.

Unit V (Transformations)

Conformal mappings – basic properties – Bilinear maps – fixed points - Applications

Text Book :

- Arumugam .S and T. Issac –“Complex Analysis” – Scitech Publishing House – Chennai.

Books for Reference :

1. Churchill .R.V. and J.W. Brown – “Complex variables and Applications” – IV edition – McGraw Hill International Editions.
2. Ponnuswamy .S – “Foundations of Complex Analysis”, Narosa Publication House, New Delhi, II edition 2005.
3. Duraipandian .P and Lakshmi Duraipandian – “Complex Analysis” – Emerald Publications, Chennai (2001)
4. Shakarchi .R, Problems and solutions of Complex Analysis. Springer – Verlag, New York 1999.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Core -11**

NUMBER THEORY

- Unit I** Peano's Axioms – Mathematical Induction – The Binomial Theorem – Early Number Theory.
- Unit II** Division Algorithm – GCD – Euclidean Algorithm – The Diophantine Equation $ax + by = c$.
- Unit III** The fundamental Theorem of Arithmetic – The Sieve of Eratosthenes – The Goldbach conjecture.
- Unit IV** Basis properties of congruences – Linear congruence and the Chinese Remainder Theorem.
- Unit V** Fermat's Theorem – Wilson's Theorem – The Fermat – Kraitchik Factorization Method.

Text Book:

- David .M. Burton - Elementary Number Theory (Sixth Edition) Tata McGraw Hill Education Pvt. Ltd.

Books for Reference :

1. Ivan Niven and H, Zuckerman - An Introduction to Theory of Numbers.
2. Kumaravelu .S, and Susheela Kumaravelu - Elements Theory - Nagercoil, 2002.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/Core – 12**

GRAPH THEORY (90 Hours)

- Unit I** Finite and infinite graphs – degree – Isolated vertex, pendent vertex and null graph – walks, paths and cycles (Definite and examples only) subgraphs – connected and disconnected graph, Eulerian and Hamiltonian
- Unit II** Trees and fundamental circuits – properties of Trees - distance and centre, binary tree, spanning tree, cut set and cut vertices - properties – connectivity.
- Unit III** Planar and dual graphs - different representation of planar graphs – Detection of planarity.
- Unit IV** Graph operations (unions, composition, product) matrix representation – incident, adjacency matrix – rank – cell set matrix – Relations, path matrix
- Unit V** Chromatic number – chromatic partitioning. Chromatic polynomial – domination – Covering (definition and examples only) - colouring – five colour Theorem - Four Colour problem.

Text Book:

- Arumugam .S and S. Ramachandran - Invitation to Graph Theory - Scitech Publications India Pvt. Limited Chennai (2004 edition)

Books for Reference :

1. Narasing Deo – Graph Theory with applications to Engineering and Computer Science - Hall of India Pvt. Ltd.
2. Kumaravelu .S – Graph Theory – Edition 1
3. Gowthem - Graph Theory
4. Roberts .F.S - Graph Theory and its Applications to problems of Society - SIAM. Odyssey Press, New Hampshire 1978.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Major Elective – III (A)**

FUZZY MATHEMATICS

- Unit I** **Crisp Sets – Fuzzy Sets** – Basic Types – Basic Concepts – Characteristics and Significance of the Paradigm shift.
- Unit II** Additional properties of α -cuts – representations of fuzzy sets – Extension principle for fuzzy sets.
- Unit III** **Fuzzy set operations** – Fuzzy complements – Fuzzy intersections : t-norms – Fuzzy Unions : t-conorms – Combinations of operations – Aggregation operations.
- Unit IV** **Fuzzy Numbers** – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations of fuzzy numbers – Lattice of fuzzy numbers – Fuzzy Equations.
- Unit V** Fuzzy Decision Making – Individual Decision Making – Multi-person decision making – Fuzzy linear Programming.

Text Book:

- * George J. Klir and Bo Bo Yuan – Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, 2002, New Delhi.

Books for Reference :

1. George J. Klir and Tina .A Folger – Fuzzy sets, uncertainty and Informations – Prentice Hall of India, 2003, New Delhi.

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Major Elective – III (B)**

Astronomy - II

- Unit I** Equation of time – Seasons – Conversion of time.
- Unit II** Moon – sidereal month, Lunation and relation between them – Phases of moon – Lunar Libration - surface of moon – metonic cycle – Tides.
- Unit III** Eclipses – shadow cone – Minimum and maximum number of eclipses.
- Unit IV** Planetary Phenomena – Bode’s law – Elongation – Sidereal period, synodic period and the relation between them – Phases – Stationary points – solar system.
- Unit V** Stellar Universe – A brief history of Astronomy. Astronomical instruments – Galaxies and constellations.

Text Book:

- S. Kumaravelu and Susheela Kumaravelu – Astronomy Rainbow Printers, Nagercoil (2005)

Books for Reference :

1. George - O - Abell – Exploration of the Universe (Second Edition)

**MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Mathematics) /
Semester-VI/ Major Elective – III (C)**

Mathematical Modelling

- Unit I (Mathematical modelling through O.D.E (First order))**
Linear growth and Decay models – Non-linear growth and Decay models –
Compartment Models – Dynamics Problems – Geometrical Problems.
- Unit II** Population dynamics – Epidemics – Compartment Models – Economics,
Medicine, Arms race, Battles and International Trade.
- Unit III (Mathematical Modelling through O.D.E. (Second order))**
Planetary motion – circular motion – Motion of satellites – Modelling through
linear difference equations of second order.
- Unit IV (Mathematical Modelling through difference equations)**
Basic theory of difference equation with constant coefficients – Economics and
Finance – Population dynamics and genetics – Probability theory.
- Unit V (Modelling through graphs)**
Solutions that can be modelled through graphs - models in terms of directed
graphs, signed graphs – weighted digraphs and unoriented graphs.

Text Book:

- Kapur .J.N – Treatment as in “Mathematical Modelling” – New Age
International Publishes, 2004.

Books for Reference :

1. Kapur .J.N – Mathematical Modelling in Biology and Medicine – East West Press –
1985.
2. Singh – Mathematical Modelling, International Book house – 2003.
3. Frank R. Giordano, Maurice D.Weir and William P. Fox, - A first course in mathematical
modelling, Thomson Learning, London and New York, 2003.