ETHIRAJ COLLEGE FOR WOMEN

(AUTONOMOUS)

CHENNAI-600 008

COLLEGE WITH POTENTIAL FOR EXCELLENCE

DEPARTMENT OF MATHEMATICS

(Aided & Self Supporting)

SYLLABUS

Choice Based Credit System

(Offered from the academic year 2018-19)

ETHIRAJ COLLEGE FOR WOMEN

(AUTONOMOUS)

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COLLEGE WITH POTENTIAL FOR EXCELLENCE

B.Sc., Mathematics

Allied Mathematics

B.Com (Business Mathematics) &

M.Com (Statistics)

SYLLABUS

CHOICE BASED CREDIT SYSTEM

(Offered from the academic year 2018-19)

CONTENTS

RULES AND REGULATIONS FOR THE PROGRAMME

As per the guidelines given by the University Grants Commission and the Tamil Nadu State Council for Higher Education, the B.Sc. degree programme is designed in such a way to have a foundation in discrete and continuous mathematics; a mathematical attitude towards problem formulation and solving; an analytical skill and desire for correctness; an appreciation of the approaching of mathematical techniques, the programming skill at higher level computer language and research aptitude to mathematics.

Department of Mathematics is revising syllabi with effect from the academic year 2018-19, as specified by the Government of Tamil Nadu. Part IV and Part V components will seek to build the capacity of the students and provide inputs for her social service and social analysis capabilities.

Every academic year is divided into two semester sessions. Each semester will have a minimum of 90 working days and each day will have 5 working hours. Teaching is organized into a modular pattern of credit courses. Credit is normally related to the number of hours a teacher teaches a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

1. ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the degree of B. Sc course shall be required to have passed the Higher Secondary Examinations conducted by Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Syndicate of the University of Madras.

2. ELIGIBILITY FOR THE AWARD OF DEGREE

The candidate shall be eligible for the award of degree only if she has under gone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the Six Semesters prescribed earning 140 credits - 12 credits from Part I, 12 credits from Part II, 95 credits from Part III, 20 credits from Part IV and 1 credit from PartV.

3. DURATION OF THE PROGRAMME: 3 YEARS

Each academic year shall be divided into two semesters. The first academic year shall comprise of the first and second semesters, the second academic year, the third and fourth semesters and the third academic year, fifth and sixth semesters respectively. The odd semesters shall consist of period from June to November of each year and the even semesters from December to April of each year. There shall not be less than 90 working days for each semester.

COURSE OF STUDY

The main subject of study for Bachelor Degree shall consist of the following:

Part – I : Tamil /Other Language

Part – II : English

Part – III : Core Subjects, Allied Subjects and Project / Electives with three Courses

Part – IV : 1. (a) Those who have not studied Tamil up to XII standard and taken a Non- Tamil Language under part I shall take Tamil Comprising of two Courses (Level will be at 6th Standard).
  (b) who have studied Tamil up to XII standard and taken a Non-Tamil language under part I shall take Advanced Tamil Comprising of two courses.
  (c) Others who do not come under a &b can choose Non-Major elective.
2. Soft skill paper(offered by English Department)
3. Environmental Studies
4. Value Education

Part V : Extension Activities.

PASSING MINIMUM

A candidate shall be declared to have passed in each paper/ practical of the main subject of study wherever prescribed, if she secured NOT LESS THAN 40% of the marks prescribed for the examination.

1. There shall be no passing minimum for Internal.
2. For External Examination Passing Minimum shall be 40% of the maximum marks prescribed for the paper for each paper / practical and project.
3. In the aggregate (External +Internal) the Passing Minimum shall be of 40%.

4. She shall be declared to have passed the whole examination, if she passes in all the papers and practical where ever prescribed / as per scheme of examinations by earning 140 credits in part I, II, III, IV and V. She shall also fulfill the extension activities prescribed earning a minimum of one credit to qualify for the degree.

CLASSIFICATION OF SUCCESSFUL CANDIDATES:

Part I, II, III & IV

Successful candidates passing the examination and securing the marks (i) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND class respectively. All other successful candidates shall be declared to have passed the examination in the THIRD class.

Candidates who pass all the examination (Part I, II, III & IV) prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

COURSE PROFILE –B.Sc Mathematics

SEM	PART	COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS / WK	TOTAL HOURS	CA	SE	TOTAL
I	I	Part I	Tamil / Hindi / French / Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	4	60	40	60	100
	III	MA18/1C/ TLT	Trigonometry and Laplace Transforms	4	5	75	40	60	100
		MA18/1C/DCL	Differential Calculus	4	5	75	40	60	100
	III	MA18/1A/FD1 (or) PH18/1A/GP1	Calculus of Finite Differences – I (or) Allied General Physics - I	5	6	90	40	60	100
	IV	Part IV	1ab/NME	2	2	30	-	50	50
			Soft Skill (offered by English department)	3	2	30	-	50	50
II	I	Part I	Tamil/Hindi/French /Sanskrit	3	5	75	40	60	100
	II	Part II	English	3	4	60	40	60	100
	III	MA18/2C/CLA	Classical Algebra	4	5	75	40	60	100
		MA18/2C/ICF	Integral Calculus and	4	5	75	40	60	100

			Code	Title						
				Fourier Series						
			MA18/2A/FD2 (or) PH18/2A/GP2	Calculus of Finite Differences – II (or) Allied General Physics - II	5	6	90	40	60	100
	IV	Part IV		1ab/NME	2	2	30	-	50	50
				Soft Skill (offered by English Department)	3	2	30	-	50	50
III	I	Part I		Tamil/Hindi/French/ Sanskrit	3	5	75	40	60	100
	II	Part II		English	3	4	60	40	60	100
	III		MA18/3C/DEQ	Differential Equations	4	5	75	40	60	100
			MA18/3C/NTY	Number Theory	4	5	75	40	60	100
			MA18/3A/MS1	Mathematical Statistics & R Software – I	5	6	90	40	60	100
	IV	Part IV		Soft Skill	3	2	30	-	50	50
				Environmental Studies	2	2	30	-	50	50
IV	I	Part I		Tamil/Hindi/French/ Sanskrit	3	5	75	40	60	100
	II	Part II		English	3	4	60	40	60	100
	III		MA18/4C/ALS	Algebraic Structures	4	5	75	40	60	100
	III		MA18/4C/VGF	Vector Calculus , Geometry and Fourier Transforms	4	5	75	40	60	100
	III		MA18/4A/ MS2	Mathematical Statistics & R Software – II	5	6	90	40	60	100
	IV	Part IV		Soft Skill	3	2	30	-	50	50
				Value Education	2	2	30	-	50	50
V	III		MA18/5C/LAL	Linear Algebra	4	5	75	40	60	100
			MA18/5C/RAN	Real Analysis	4	5	75	40	60	100
			MA18/5C/STT	Statics	4	6	90	40	60	100
			MA18/5C/OPT	Optimization Techniques	4	5	75	40	60	100
			MA18/5E/PLC	Programming Language 'C'	3	6	90	40	60	100
			MA18/5E/PR1	Programming Language 'C' (Practicals)	2	3	45	-	100	100
VI	III		MA18/6C/CAN	Complex Analysis	4	5	75	40	60	100
			MA18/6C/DYN	Dynamics	4	6	90	40	60	100
			MA18/6C/DIM	Discrete Mathematics	4	5	75	40	60	100

		MA18/6E/OPR	Operations Research	5	5	75	40	60	100
		MA18/6E/PCO	Programming Language 'C'& Introduction to OOP	3	6	90	40	60	100
		MA18/6E/PR2	Programming Language 'C'& Introduction to OOP (Practicals)	2	3	45	-	100	100

Total minimum credits for B.Sc Mathematics: 140

EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT-UG

INTERNAL VALUATION BY COURSE TEACHER/S

PART I, II AND III-THEORY PAPERS

COMPONENT	TIME	MAX.MARKS	CAMARK
1. *TEST I	2 HOURS	50 MARKS (TO BE CONVERTED)	10
2. *TEST II	2 HOURS	50 MARKS (TO BE CONVERTED)	10
3. ASSIGNMENT/SEMINAR/FIELD VISIT			10
4. PARTICIPATORY LEARNING			10
TOTAL			**40**

RUBRICS FOR CA EVALUATION

Assignment	Content/originality/Presentation/Schematic Representation and Diagram/Bibliography

Seminar	Organisation/Subject Knowledge/Visual Aids/Confidence level/presentation-Communication and Language
Field Visit	Participation/Preparation/Attitude/Leadership
Participation	Answering Questions/Clearing Doubts/Participating in Group Discussions/Regular Attendance

END SEMESTER EVALUATION PATTERN-UG

THEORY PAPERS

PART III (Major & Allied)

SEMSTER I / II / III / IV / V / VI

DOUBLE VALUATION BY COURSE TEACHER AND EXTERNAL EXAMINER

MAXIMUM MARKS: 100 TO BE CONVERTED TO 60

PASSING MARK: 40

PART IV

SINGLE VALUATION

ORAL TEST/WRITTEN TEST

MAXIMUM MARKS: 50

PASSING MARK:20

PRACTICAL PAPERS

PART III

SEMSTER   V/ VI

COMPONENT   **MARKS**

1. Practical Examination   90
2. Record   10

Two **internal examiners** (appointed in consultation with Head of the department / Principal of the college) to be appointed to conduct the practical examination.

There will be three questions with or without subsections to be asked for the practical examination.

Assessment of Computer Practical Examination.

 For each question

Programming skill (writing)   - 10 Marks
Technical Skill (Keying)   - 10 Marks
Debugging and generating output   - 10 Marks

MAXIMUM MARKS: 100

PASSING MARKS: 40

SEMESTER I COURSE PROFILE - PROGRAMME OF STUDY

COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS/ WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL
Part I	Tamil / Hindi / French / Sanskrit	3	5	75		40	60	100
Part II	English	3	4	60	2-1-1	40	60	100
MA18/1C/ TLT	Trigonometry and Laplace Transforms	4	5	75	3-2-0	40	60	100
MA18/1C/DCL	Differential Calculus	4	5	75	3-2-0	40	60	100
MA18/1A/FD1 (or) PH18/1A/GP1	Calculus of Finite Differences – I (or) Allied General Physics - I	5	6	90	3-3-0	40	60	100
Part IV	1ab/NME	2	2	30		-	50	50
	Soft Skill (Offered by English department)	3	2	30		-	50	50

<center>**SEMESTER – I**</center>

<center>**TRIGONOMETRY AND LAPLACE TRANSFORMS**</center>

TOTAL HOURS: 75 Hours   **COURSE CODE: MA18/1C/TLT//**
                                                                                    MC18/1C/TLT
CREDITS: 4   **L – T – P :   3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Know the principles and concepts of Trigonometry and Laplace Transforms.
2. Compute logarithm of a complex quantity.
3. Apply Laplace Transform to solve differential equations.

COURSE OUTLINE:

UNIT I   **:** Expansion of Sin nx, Cos nx, tan nx, $Sin^n x$, $Cos^n x$. Expansion of Sin x, Cos x,
            tan x in ascending powers of x
            Book 1 Chapter 3 Sec 1,2,4,5   **(15 Hours)**

UNIT II   **:** Hyperbolic Functions: definition, relation between hyperbolic functions and
            Inverse hyperbolic functions.
            Book 1 Chapter 4 Sec 1,2.1,2.2,2.3   **(20 Hours)**

UNIT III: Logarithm of complex quantities
            Book 1 Chapter 5 Sec 5 -5.1,5.2.   **(10 Hours)**

UNIT IV: Summation of Trigonometric series by using complex quantities: C+iS form,
            Gregory series (only simple problems in both the cases)
            Book 1 Chapter 6 Sec 3   **(15 Hours)**

UNIT V: Laplace Transform:Laplace Transform- Inverse Transform, properties.
            Application of Laplace Transform to solution of the first and second order linear
            differential equations (with constant coefficients)
            Book 2 Chapter 9   **(15 Hours)**

BOOKS RECOMMENDED :

1. S. Narayan and T.K. Manicavachagom Pillay, Trigonometry (2012), S.viswanathan
   Printers & Publishers Pvt. Ltd , Chennai .
2. S. Narayan and T.K. Manicavachagom Pillay, Differential Equations & its
   Applications (2003) ,S.Viswanathan printers and publishers Pvt. Ltd, Chennai.

REFERENCE BOOKS:

1. A.Singaravelu, Algebra and Trigonometry Volume I (2003), Meenakshi Agency,
   Chennai.

2. S.L.Loney , Plane Trigonometry – Part II (1982)., Cambridge University Press London.
3. Dr.M.D. Raisinghania, H.C.Saxena, H.K.Dass, Trigonometry (1999), S. Chand & company Pvt Ltd, New Delhi.
4. B.S. Grewal, Higher Engineering Mathematics (2002), Khanna Publishers, New Delhi .
5. Dr.A.Singaravelu , Differential Equations and Laplace Transforms, New Revised Edition (2015), A.R.S Publications, Chennai.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING SOURCES:

1. http://www.mathforum.org
2. http://www.opensource.org
3. http://www.khanacademy.org
4. http://www.in.ixl.com
5. http://www.learningwave.com

SEMESTER – I

DIFFERENTIAL CALCULUS

TOTAL HOURS: 75 Hours   **COURSE CODE: MA18/1C/DCL**
CREDITS: 4   **L – T – P : 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Get exposed to the various concepts of Differential Calculus like n^{th} derivatives, maxima and minima.
2. Apply differentiation to find envelope, curvature and pedal equation of a curve.
3. Develop problem solving skills.

COURSE OUTLINE:

UNIT I: Successive Differentiation- n^{th} derivative , standard results – Leibnitz Theorem (without Proof) and its applications
     Book 1   Chapter 3   Section 1.1 -1.6 & Section 2.1 -2.2   **(18 Hours)**

UNIT II: Jacobians – Maxima and minima of functions of two independent variables. Necessary and Sufficient conditions (without proof) – Lagrange's method of undetermined multipliers (without proof)

Book 1   Chapter 8   Section 4, 4.1, 5
Book 2   Chapter 3   **(17 Hours)**

UNIT III: Envelopes: Curvature – Circle , radius and centre of curvature, Cartesian formula
for the radius of curvature.
Book 1   Chapter 10   Section 1.1- 1.3, 2.1-2.3   **(12 Hours)**

UNIT IV: Co-ordinates of thecentre of curvature – Curvature- radius of curvature in polar
Co-ordinates, p-r equations, Pedal equation of a curve
Book 1   Chapter 10   Section 2.4, 2.6 - 2.8   **(10 Hours)**

UNIT V: Definition – Asymptotes parallel to the axis, oblique asymptotes,
$F_n + F_{n-2} = 0$ form, Intersection of a curve with its asymptotes
(proofs are not   included)
Book 1   Chapter 11   Section 1 - 4 & Sections 6 - 7   **(18 Hours)**

BOOKS RECOMMENDED :

1. S. Narayanan & T.K. Manickavachagom Pillay, Calculus ,Volume I (2004) ,

   S. Viswanathan Printers & Publishers Pvt Ltd. Chennai.

2. A.Singaravelu and R.Ramaa, Calculus and Co-ordinate Geometry of two dimension, First

   edition (2003) Meenakshi Agency, Chennai.

REFERENCE BOOKS :

1. Dr.S.Sudha ,Calculus , First edition (1998) ,Emerald Publishers, Chennai.
2. S.C.Arora & Ramesh Kumar, A Text Book of CALCULUS, First dition (1984), Pitambar
   Publishing Company-New Delhi.
3. R.K Ghosh, K.C.Maity ,An Introduction to Analysis, Differential Calculus ,Part-I, Tenth
   edition (1999), Books and Allied (P) Ltd-Calcutta.
4. Shanti Narayanan, P.K.Mittal, Differential Calculus, Tenth Revised Edition(2005),S.Chand
   & Company Pvt Ltd,   New Delhi.
5. Apostal.T.M ,Calculus- Volume I, Second edition , Wiley Publications, New Delhi.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING SOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://www.khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

CALCULUS OF FINITE DIFFERENCES – I

TOTAL HOURS: 90   **COURSE CODE: MA18 / 1A / FD1 //**
                                                              MC18 / 1A / FD1

CREDITS: 5   **L-T-P: 4 2 0**

COURSE OBJECTIVES:

To enable students to
1. Solve Mathematical Problem using difference Operator.
2. Compute Numerical Solution of Differentiation and Integration problems.
3. Interpolate an unknown value from a given set of data.

COURSE OUTLINE:

UNIT I   : FINITE DIFFERENCES
Forward, Backward, Divided difference and Shift Operators, Relation between operators, representation of polynomials in factorial notations, Successive differences of polynomial- Differences of zero. Simple problems. (Proof of theorems in finite differences excluded)   **(20 Hours)**

UNIT II   : INTERPOLATION
Newton's forward and backward formulae for interpolation- Central difference formulae- Gauss forward, Gauss backward ,Stirling's and Bessel's formulae **(**Derivations not included for all the formulae)   **(20 Hours)**

UNIT III : INTERPOLATION (contd)
Lagrange's formula for interpolation – Newton's divided differences formula. Lagrange's inverse formula. (Derivations are not included)   **(15 Hours)**

UNIT IV : NUMERICAL DIFFERENTIATION
Methods of derivatives using interpolation formulae (only first order), maxima and minima using Newton's forward formula – simple problems.   **(15 Hours)**

UNIT V : NUMERICAL INTEGRATION
Quadrature formula for equidistant ordinates based on Newton's Forward formula Trapezoidal rule – Simpson's one third rule – Simpson's three Eighth rule.

(20 Hours)

BOOKS RECOMMENDED:

1. B.D.Gupta, Numerical Analysis (1989), Konark Publication, Ltd , New Delhi.
2. S.G.Venkatachalapathy, Calculus of finite differences and Numerical analysis (2003), Margham publications, Chennai.
3. Dr. M.K. Venkataraman, Numerical Methods in Science & Engineering, Fifth edition (1999), The National Publishing Company ,Chennai.

REFERENCE BOOKS:

1. H.C. Saxena, Finite Differences and Numerica Analysis Fifteenth edition (2000) S.Chand &Co, New Delhi.

2. S.Arumugham ,Numerical Methods, Second edition (2008) ,New Gamma Publishing, Palayamkottai.

3. M.K.Jain,S.R.K.Iyengar,R.K.Jain, Numerical methods for scientific and Engineering Computation , Sixth edition (2012) ,New age International Publishers, New Delhi .

4. E.Balagurusamy,Numerical Methods (1999), Tata Mc-Graw Hill, New Delhi.

5. T.K. Manicavachagom Pillay & Prof. S. Narayanan, Numerical Analysis , New edition (2001), S.Viswanathan Printers& Publishers Pvt Ltd ,Chennai.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. http://www.mathforum.org

2. http://www.opensource.org

3. http://www.khanacademy.org

4. http://in.ixl.com

5. http://www.learningwave.com

SEMESTER II COURSE PROFILE

COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS/ WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL
Part –I	Tamil/Hindi/ French /Sanskrit	3	5	75		40	60	100
Part- II	English	3	5	75	2-1-1	40	60	100
MA18/2C/CLA	Classical Algebra	4	5	75	3-2-0	40	60	100
MA18/2C/ICF	Integral Calculus and Fourier Series	4	5	75	3-2-0	40	60	100
MA18/2A/FD2 (or) PH18/2A/GP2	Calculus of Finite Differences – II (or) Allied General Physics - II	5	6	90	3-3-0	40	60	100
Part- IV	1ab/NME	2	2	30		-	50	50
	Soft Skill (Offered by English Department)	3	2	30		-	50	50

CLASSICAL ALGEBRA

TOTAL HOURS: 75 Hours   **COURSE CODE: MA18/2C/CLA**
CREDITS: 4   **L – T - P : 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Sum the Series using Binomial, Exponential and Logarithmic series.
2. Compute the inverse of the matrix using Cayley Hamilton Theorem
3. Understand the basic concepts of Theory of Numbers.

COURSE OUTLINE:

UNIT I: Summation of series using Binomial, Exponential and Logarithmic series
        Book 1 - Chap 3 Sec 10, Chap 4 Sec 3,9   **(12 Hours)**

UNIT II: Theory of Equations: Polynomial Equations – Relation between roots and
        Coefficients – symmetric functions of roots, Formation of equation.
        Book 1 - Chap 6 Sec 1-12   **(18 Hours)**

UNIT III: Transformation of Equations, Reciprocal equations – Descartes' rules of signs,
        Approximation of roots of cubic equations by Horner's method .
        Book 1-Chap 6 Sec 15-17, 24, 30   **(12 Hours)**

UNIT IV: Matrices: Symmetric – Skew- symmetric- Hermitian, Skew-Hermitian,
        Orthogonal and Unitary matrices, Cayley- Hamilton theorem (without proof), finding
        the inverse of a matrix using Cayley-Hamilton theorem. Eigen Values and Eigen
        vectors – Similar matrices – Diagonalisation.
        Book 2   Chap 2 Sec 1-8, 9.1,16   **(15 Hours)**

UNIT V: Theory of numbers: prime and composite numbers, decomposition into prime
        Factors (without proof), Divisors of a positive integer 'n', Euler function $\phi(n)$,
        Formula for $\phi(n)$ (without proof), the higher power of a prime contained in n!,
        Congruences, Fermat's and Wilson's theorem (without proof)- simple problems.
        Book2 Chap 5 Sec 1,6-8,10-13,16,17.   **(18 Hours)**

BOOKS RECOMMENDED:

1. T.K.Manicavachagam Pillay,T.Natarajan,K.S.Ganapathy, Algebra Volume-I (2008)

   S.Viswanathan Printers & Publishers Pvt. Ltd, Chennai.

2. T.K. Manicavachagam Pillay, T.Natarajan, K.S.Ganapathy, Algebra Volume – II (2008)

   S.Viswanathan Printers & Publishers Pvt. Ltd, Chennai.

REFERENCE BOOKS:

1. P.R.Vittal and V.Malini, Algebra and Trigonometry (2003), Margam Publishers, Chennai.
2. Dr.A.Singaravelu, Algebra and Trigonometry Vol I & II (2003), Meenakshi Agency, Chennai.
3. Dr.S.Arumugam, Prof. A.Thangapandi Isaac , Classical Algebra (2003), New gamma Publishing House, Palayamakottai.
4. H.K. Dass, H.C.Saxena, M.D.Raisingghania, Matrices (1999), S.Chand & Company Pvt. Ltd , New Delhi.
5. Dr. Sudir K. Pundir, Dr. Rimple Pundir, Theory of numbers , Third Revised edition(2012), Pragati Prakashan , Meerut.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING SOURCES:

1. http://www.mathforum.org

2. http://www.opensource.org

3. http://www.khanacademy.org

4. http://www.in.ixl.com

5. http://www.learningwave.com

SEMESTER- II

INTEGRAL CALCULUS AND FOURIER SERIES

TOTAL HOURS: **75 HOURS**   **COURSE CODE: MA18/2C/ICF**
CREDITS: 4   **L -T - P : 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Get exposed to the concepts of reduction formulae and Fourier Series
2. Apply double and triple integral to find the area and volume.
3. Understand the concepts of Beta and Gamma functions and their applications.

COURSE OUTLINE:

UNIT-I : Integral Calculus:
  Reduction formulae, $\int e^{ax}\cos bx \, dx$, $\int e^{ax}\sin bx \, dx$-
  $\int \sin^m x \cos^n x \, dx$ (m, n being positive integers),

$\int x^m (\log x)^n \, dx$, $\int \cos^m x \cos nx \, dx$, $\int \cos^m x \sin nx \, dx$, Bernoulli's formula
Book 1 Chap 1 Sec 1.3, 13.1 – 13.10, 14,15 **(15 Hours)**

UNIT-II: Double integrals (Cartesian co-ordinates only), change of order of integration.
Book 1 Chap 5 Sec 2.1, 2.2 **(15 Hours)**

UNIT-III: Triple integrals, Application of multiple integrals in finding area and volume.
(Cartesian co- ordinates only)
Book 1 Chap 5 Sec 4, 5.1-5.3 **(15 Hours)**

UNIT-IV: Beta and Gamma functions (applications to simple problems)
Book 1 Chap 7 Sec 2.1-2.3, 3, 4. **(15 Hours)**

UNIT-V: Fourier Series:
Fourier series of periodic functions, Fourier series of odd and even functions
Book 2 Chap 6 Sec 1-3 **(15 Hours)**

BOOKS RECOMMENDED :

1. S. Narayan and T.K. Manicavachagom Pillay, Calculus Volume – II (2008), S.Viswanathan Printers & Publishers Pvt. Ltd, Chennai.
2. S. Narayan and T.K. Manicavachagom Pillay, Calculus Volume – III (2008), S.Viswanathan Printers & Publishers Pvt. Ltd, Chennai.

REFERENCE BOOKS:

1. P.Kandasamy and K. Thilagavathi, Mathematics for B.Sc., Volume II (2004) , S.Chand & Company Ltd , New Delhi.
2. Apostol,T.M , Calculus Volume II Fourth edition (1991), John Wiley and Sons, Inc., New York.
3. S.C.Arora & Ramesh Kumar, A Text Book of CALCULUS, First edition (1984), Pitambar Publishing Company,New Delhi.
4. ShantiNarayan,P.K.Mittal ,Integral Calculus, Tenth Revised Edition (2005), S.Chand & Company Ltd.,New Delhi.
5. R.K Ghosh,K.C.Maity , An Introduction to Analysis, Integral Calculus,Part-I, Ninth edition (1999), Books and Allied (P) Ltd-Calcutta.

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1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
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4. **http://in.ixl.com**

5. **http://www.learningwave.com**

SEMESTER – II

CALCULUS OF FINITE DIFFERENCES – II

TOTAL HOURS: 90   **COURSE CODE: MA18 / 2A / FD2//**
                                                       MC18/2A/FD2

CREDITS: 5   **L - T - P: 4 2 0**

COURSE OBJECTIVES:

To enable students to

1. Find the numerical solutions of Algebraic, Transcendental & Simultaneous equations.
2. Understand the fundamental concepts of difference equation.
3. Compute the numerical solution of ordinary differential equation.

COURSE OUTLINE:

UNIT I: Summation of series: Use of forward difference operators – Summation using
Euler – Maclaurin's formula   **(20 Hours)**

UNIT II: Solution of Algebraic and Transcendental Equations: Numerical solutions of
Polynomial and Transcendental equations in one variable. Bisection Method,
Method of false position (Regular falsi Method), Newton Raphson Method,
Method of iteration**.**   **(20 Hours)**

UNIT III: Solution of a system of Algebraic Equations: Numerical solution of Simultaneous
Linear Equations in three variables by Gauss Elimination Method, Gauss Jordan
Method, Jacobi Iteration Method, Gauss Seidel Method**.**   **(20 Hours)**

UNIT IV: Difference equations: Definition, method of solutions, First order linear
difference equation with constant, variable coefficients, second order linear
difference equation with constant Coefficients- Particular integrals of type
$a^x, x^m, x^m a^x$ – Simple problems.   **(15 Hours)**

UNIT V: Numerical solution of ordinary differential equations of first order:
Euler's method,Modified Euler Method, Picard's method of successive
approximation, Range- Kutta Method of order four.   **(15 Hours)**

BOOKS RECOMMENDED:

1. B.D.Gupta, Numerical Analysis (1989), Konark Publication, Ltd , New Delhi.

2. S.G.Venkatachalapathy, Calculus of finite differences and Numerical analysis (2003),
   Margham publications, Chennai.

3. Dr. M.K. Venkataraman, Numerical Methods in Science & Engineering, Fifth edition
   (1999), The National Publishing Company ,Chennai.

REFERENCE BOOKS:

1. H.C. Saxena, Finite Differences and Numerica Analysis Fifteenth edition (2000) S.Chand &Co, New Delhi.
2. S.Arumugham ,Numerical Methods, Second edition (2008) ,New Gamma Publishing, Palayamkottai.
3. M.K.Jain,S.R.K.Iyengar,R.K.Jain, Numerical methods for scientific and Engineering Computation , Sixth edition (2012) ,New age International Publishers, New Delhi .
4. E.Balagurusamy,Numerical Methods (1999), Tata Mc-Graw Hill, New Delhi.
5. T.K. Manicavachagom Pillay & Prof. S. Narayanan, Numerical Analysis , New edition (2001), S.Viswanathan Printers& Publishers Pvt Ltd ,Chennai.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://www.khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

SEMESTER III COURSE PROFILE

COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS/ WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL
Part I	Tamil/Hindi/ French/ Sanskrit	3	5	75		40	60	100
Part II	English	3	5	75	2-1-1	40	60	100
MA18/3C/DEQ	Differential Equations	4	5	75	3-2-0	40	60	100
MA18/3C/NTY	Number Theory	4	5	75	3-2-0	40	60	100

MA18/3A/MS1	Mathematical Statistics & R Software – I	5	6	90	4-1-1	40	60	100
Part IV	Soft Skill	3	2	30		-	50	50
	Environmental Studies	2	2	30	2-1-0	-	50	50

SEMESTER III

DIFFERENTIAL EQUATIONS

TOTAL HOURS: 75   **COURSE CODE: MA18/3C/DEQ**
CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:
To enable students to

1. Distinguish ordinary differential equations from partial differential equations.
2. Solve second order differential equations.
3. Determine the solution of exact differential equation using Integrating factor.

COURSE OUTLINE:

UNIT I: Equations of first order and first degree equation; variable separable method, homogeneous equations. **(Not for Examination purpose)**
Chapter II Sections 1-2
Equations of first order and first degree equation: Bernouilli's equation
Equations of first order but of higher degree – Equations solvable for p – Equations solvable for x – Equations solvable for y – Clairaut's Equation
Chapter II Sections 4-5
Chapter IV Sections 1-3   **(20 Hours)**

UNIT II : Linear equation with constant coefficients, P.I for e^{ax} ,cos mx, sin mx, e^{ax} V where V is x^m ,cos mx, sin mx, m being a positive integer.
Chapter V   Sections 1 – 4   **(15 Hours)**

UNIT III: Linear equation with variable coefficients: $ax^2 \frac{d^2y}{dx^2} + bx \frac{dy}{dx} + cy = Q.$
Method of variation of parameters-simple problems.
Chapter V   Section 5

25

Chapter VIII Section 4 **(10 Hours)**

UNIT IV: Exact equations : I.F $\dfrac{1}{Mx+Ny}$, $\dfrac{1}{Mx-Ny}$, $\dfrac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}$, $\dfrac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$

Total Differential Equations, Lagrange's equation: $\dfrac{dx}{P} = \dfrac{dy}{Q} = \dfrac{dz}{R}$

Chapter II Section 6
Chapter VI Sections 4, 5
Chapter XI Sections 1.3, 1.4 **(15 Hours)**

UNIT V :Partial Differential Equations: Formation of P.D.E, Complete integrals, particular integrals, singular integrals. Lagrange's Method of solving linear equation,Non-linear equations of the first order: The four standard forms.
Chapter XII Sections 1- 4, 5.1 – 5.4 **(15 Hours)**

RECOMMENDED TEXTBOOKS:

S. Narayanan& T.K. Manicavachagam Pillay, Differential Equations and its applications ,Revised Ninth Edition (1985) ,S.Viswanathan Printers & Publishers Pvt. (Ltd.), Chennai.

REFERENCE BOOKS:

1. P.R. Vittal ,Differential Equations and Laplace transformations, First edition (2004), Margham Publications , Chennai.
2. Zafar Ahsan, Differential equations and their applications, Second edition (2006), Prentice Hall of India Pvt. Ltd , New Delhi.
3. Richard Bronson, Gabriel B. Costa, Differential Equations ,Third edition (2000) Schaum's Outlines, Mc Graw Hill Education, New York.
4. Dr.M.D.Raisinghania,Ordinary and Partial Differential Equations, Revised Ninth edition(2005), S.Chand & Compant Ltd , New Delhi.
5. M.K.Venkataraman, Higher Engineering Mathematics, III-B (1998), National Publishing Co, Chennai.

JOURNALS:
1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
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SEMESTER – III
NUMBER THEORY

TOTAL HOURS: 75
CREDITS: 4   **L - T –P: 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Get exposed to the fundamental concepts of Number Theory.
2. Understand the importance of Number Theory in Cryptography.
3. Develop Problem solving skills.

UNIT I: Introduction: Basic Binary Operations on the set of Integers- Ordering of the Integers-
Well ordering principle-mathematical Induction.
   Chapter 1 Sections 1.3 - 1.6   **(7 Hours)**

UNIT II: Divisibility Theory: Greatest common Divisor- Relatively Prime integers – Algorithm
to Find G.C.D : Investigation of the set of Integers {bx+cy}- Least Common Multiple.
   Chapter 2 Sections 2.3 - 2.5 and 2.7.   **(17 Hours)**

UNIT III: Linear Diophantine Equations: Linear Diophantine Equations- The Equation
ax+by=c - Diophantine Equation in Three or More Unknowns- Diophantine Equation
of the Second Degree (Statements of theorems and problems only)
   Chapter 3 Sections 3.2 - 3.5

   Cryptography: Applications to Cryptography, Data encryption standard, Asymmetric
   key cryptography.
   Chapter 7 Sections 7.8-7.10   **(17 Hours)**

UNIT IV: Quadratic Residues: Introduction, quadratic residues, Elementary Properties.
   Chapter 9   Sections 9.1- 9.3   **(17 Hours)**

UNIT V: Perfect Numbers : Introduction, Perfect Numbers, Necessary and sufficient
   Conditions for a positive Integer to be an even Perfect number, Mersenne Numbers,
   Fermat Numbers.
   Chapter 10   Sections 10.1-10.5   **(17 Hours)**

BOOKS RECOMMENDED:

   Pundir & Pundir ,Theory of Numbers, Third revised edition (2012), Pragati Prakashan,
   Meerut.

REFERENCE BOOKS:
   1. Ivan M. Niven and Zuckerman , An Introduction to the theory of numbers, Fifth
      edition(1991), Wiley Publications, New Delhi.

2. C.Y. Hsiung, Elementary theory of numbers (1995), Allied Publishers Limited, New Delhi.
3. David . M. Burton , Elementary Number Theory (1980.), Allyn and Bacon Inc., Boston.
4. H.E. Rose ,A course in Number Theory , Second Edition , Oxford Science Publications.
5. Tom. M. Apostol, Introduction to Analytic Number Theory (1989), Narosa Publishing House, New Delhi.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
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SEMESTER – III

MATHEMATICAL STATISTICS & R SOFTWARE –I

TOTAL HOURS: 90 Hours	COURSE CODE: MA18 /3A/ MS1// MC18 /3A/MS1
CREDITS: 5	L- T- P : 4 1 1

COURSE OBJECTIVES:

To enable students to
1. Distinguish between discrete and continuous distribution.
2. Be equipped with the knowledge of R- Programming and apply it to compute statistical measures.
3. Understand the degree of relationship between two variables and to compute the relationship as linear equations.

COURSE OUTLINE:

Concept of probability to be revised (not included for examination purpose)

THEORY COMPONENT

UNIT I: RANDOM VARIABLES

Definition of a random variable, discrete and continuous random variable, mathematical expectation of a discrete and continuous random variable.
Book 1   Chapter 5 Sections 5.1 - 5.4.1
Chapter 6 Sections 6.1 - 6.7   **(15 Hours)**

UNIT II: DISCRETE DISTRIBUTIONS
Binomial, Poisson distributions - Definitions, mean, median, mode, recurrence formula for moments, moment generating function, additive property, fitting of distributions.
Book 1   Chapter 7   **(15 Hours)**

UNIT III: CONTINUOUS DISTRIBUTION
Rectangular distribution, Normal distribution - Definition, limiting form of Binomial distribution,(derivation excluded).Chief characteristics of normal distribution. Normalprobability curve, mean, mode, median, moment generating functions, moments, Area property, fitting of normal distribution.
Book 1   Chapter 8 Sections 8.1-8.2.14   **(15 Hours)**

UNIT IV: CORRELATION &REGRESSION
Simple correlation - Rank correlation, product moment correlation for raw and grouped data. Regression lines for X on Y and Y on X, computation of means, variances and correlation coefficient from regressionlines.
(Derivation of formulae for correlation and regression lines excluded).
Book 1   Chapter 10 Sections 10.1-10.6.1, 10.7- 10.7.5   **(30 Hours)**

PRACTICAL COMPONENT
UNIT V: COMPUTATIONAL STATISTICS USING "R" SOFTWARE
Diagrammatic representation of data by subdivided and multiple Bar diagram, pie chart. Graphical representation of frequency data Rod & Spike graph, frequency polygon. Less than and more than O gives. Correlation and rank correlation between two variables. Regression lines of X on Y and Y on X
(Internal Practical only, No questions for the end semester examination)
 Book 2   **(15 Hours)**

BOOKS RECOMMENDED:
1. S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics, Third edition (2015), Sultan Chand & Son Publications, New Delhi.
2. Sudha G.Purohit, Sharad D.Gore and Shailaja R. Deshmukh, Statisitcs using R , Second Edition (2015), Narosa Publishing House, New Delhi.

REFERENCE BOOKS:
1. P.R. Vittal, Mathematical Statistics (2002), Margham Publications, Chennai.
2. S.C. Gupta and V.K. Kapoor, Fundamentalsof Mathematical Statistics Eleventh edition (2002), Sultan Chand & Sons Publications, New Delhi.
3. Robert V. Hogg, Joseph Mckean & Craig A.T ,Introduction to Mathematical Statistics, (2013), Pearson Education India.
4. George W. Snedecor , William G.Cochran, Statistical Methods (1967),Oxford & IBH Publishers,
5. Dr.S.P. Gupta, Statistical Methods ,41st edition (2011) ,Sultan Chand & Sons , New Delhi .

JOURNALS
1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.

2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://www.khanacademy.org**
4. **http://www.in.ixl.com**

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SEMESTER IV COURSE PROFILE

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COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS/ WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL
Part I	Tamil/Hindi/French/ Sanskrit	3	5	75		40	60	100
Part II	English	3	5	75	2-1-1	40	60	100
MA18/4C/ALS	Algebraic Structures	4	5	75	3-2-0	40	60	100
MA18/4C/VGF	Vector Calculus , Geometry and Fourier Transforms	4	5	75	3-2-0	40	60	100
MA18/4A/MS2	Mathematical Statistics & R Software – II	5	6	90	4-1-1	40	60	100
Part IV	Soft Skill	3	2	30		-	50	50
	Value Education	2	2	30		-	50	50

SEMESTER- IV
ALGEBRAIC STRUCTURES

TOTAL HOURS: 75 Hours   **COURSE CODE: MA18/4C/ALS**
CREDITS : 4   **L – T- P: 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Understand algebraic concepts of groups and rings.
2. Analyze and understand theorems on algebraic concepts.
3. Analyze the similarities and differences between two groups or rings.

COURSE OUTLINE:

 UNIT I   **:** Groups – subgroups.
           Chapter 2 sections 2.1-2.4   **(15 Hours)**

UNIT II   **:** Normal subgroups – Quotient groups.
           Chapter 2 sections 2.5, 2.6   **(15 Hours)**

UNIT III : Homomorphism –Isomorphism – Automorphism - Cayley's theorem,
            Permutation groups.
            Chapter 2 sections 2.7-2.10 (Excluding applications 1 and 2 of section 2.7.
            Examples 2.8.1 & 2.8.2 and applications of section 2.9)   **(15 Hours)**

UNIT IV: Rings: Definitions – Examples - Some Special Classes of rings-
            Homomorphism - Isomorphism.
            Chapter 3 sections 3.1-3.3   **(15 Hours)**

UNIT V: Ideals and quotient rings - Maximal Ideals, Principle Ideals, Principle Ideal rings –
            Euclidean rings.
            Chapter 3 sections 3.4, 3.5, 3.7   **(15 Hours)**

BOOKS RECOMMENDED:

1. N. Herstein (1989) Topics in Algebra, (2nd edition) Wiley Eastern Ltd. New Delhi.
2. M.Artin, Algebra, Prentice-Hall of India, 2005.

REFERENCE BOOKS:

1. S. Arumugam (2004) Modern algebra,ScitechPublications,Chennai.
2. K. Viswanatha Naik, Modern algebra, Emerald Publishers.
3. Joseph Gallian, Contemperory Algebra, NarosaPublications,Chennai.
4. Schuam's outlines- Group theory, Benjamin baumslag, Bruce chandler, Tata Mc.Graw-Hill Publishing company Ltd.
5. M.L.Santiago (1988) Modern Algebra Arul Publications, Chennai.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
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E- LEARNING RESOURCES:

1. **http://www.mathforum.org**
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5. **http://www.learningwave.com**

SEMESTER IV

VECTOR CALCULUS, GEOMETRY AND FOURIER TRANSFORMS

TOTAL HOURS: 75   **COURSE CODE: MA18/4C/VGF**
CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:
To enable students
1. Understand the fundamental concepts of vector differentiation.
2. Compute line, Surface & volume integral by using Green's, Stokes & Gauss Divergence theorem.
3. Compute the Fourier Transform of a continuous function.

COURSE OUTLINE:
UNIT I: Vector Differentiation: Directional Derivative, gradient, unit normal to the surface, equation of tangent plane to a surface, equation of normal to a surface , Divergence, Curl, Laplace operators.
     Book1 Chapter 2   Sections 2.1 - 2.13   **(15 Hours)**

UNIT II: Evaluation of line integral, surface integral and volume integral
     Book1 Chapter 3   Sections 3.1 - 3.6   **(15 Hours)**

UNIT III: Application of Green's theorem, Gauss-Divergence theorem, Stokes' theorem
(proofs of theorems not included), simple problems
Book1 Chapter 4   Sections 4.1 - 4.8   **(15 Hours)**

UNIT IV: Planes: Equation of a plane, Angle between two planes, equation of a plane
through line of intersection of two planes , length of perpendicular, To find the
equation of the plane which bisects the angle between two given planes, simple
problems.
Book 2 Chapter II Sections 1-11   **(15 Hours)**

 UNIT V: Polar Coordinates :
Distance between the points, area of triangle – equation of straight line
(Circle - Not included)
Fourier Transforms:
Integral Transforms, Fourier integral theorem (without proof), Fourier sine and
cosine integrals (only formulae), Fourier Transforms, Fourier sine transforms and
cosine transforms of elementary functions – Simple Problems
(Properties of Fourier Transforms excluded)
Book 3 Chapter 5, Book 4 Chapter 6   **(15 Hours)**

RECOMMENDED TEXTBOOKS:
1. Duraipandian, P., Kayalal Pachaiyappa, Vector Analysis, First edition (2014), S.Chand & Company Ltd., New Delhi.
2. T.K. Manicavachagam Pillay & T.Natrajan Revised edition (1996) , Analytical Geometry (Part II - Three dimensions), S. Vishwanathan Printers and publishers pvt.ltd, Chennai.
3. Prof. S.G. Venkatachalapathy , Analytical Geometry (Two dimensions & Three dimensions), First edition (2008),Margham Publications, Chennai.
4. A. Singaravelu, Differential Equations, Fourier series and Laplace Transforms, First edition (2002), Meenakshi Traders, Chennai.

REFERENCE BOOKS:

1. M.L.Khanna, Co-ordinate Geometry (2016), Jai Prakash Nath & co.
2. P.R. Vittal, Vector analysis, Analytical solid geometry and sequences and series, Third edition (2003), Margham Publications, Chennai.
3. Dr.K.Venkataraman- Engineering Mathematics – Part B , National Publishing Company , Chennai.
4. B.S.Grewl, Higher Engineering Mathematics (2002), Khanna Publishers, New Delhi.
5. G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry , Ninth Edition (1998), Addison Wesley, New Delhi.

JOURNALS:

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2. Discrete Mathematical Sciences & Cryptography

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SEMESTER –IV

MATHEMATICAL STATISTICS & R SOFTWARE – II

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TOTAL HOURS: 90 Hours	**COURSE CODE: MA18/4A/MS2//**
	MC18/4A/MS2
CREDITS: 5	**L –T- P: 4 1 1**

 COURSE OBJECTIVES:

To enable students to

1. Understand the concepts of sampling, testing of hypothesis, critical region and standard error.
2. Be familiarized with applications of various tests of significance.
3. Be equipped with the knowledge of R-Programming and apply it to compute statistical measures.

COURSE OUTLINE:

THEORY COMPONENT

UNIT I: SAMPLING THEORY: `
Tests of Hypothesis, Concepts of standard Error, Null Hypothesis, Alternative Hypothesis, Error in Sampling, Critical region and Level of Significance, One tailed and Two tailed tests, degrees of freedom, Simple and composite hypothesis, Size and power of a test.
Book 1 Chapter 12 Sections 12.1 - 12.7   **(15 Hours)**

UNIT II: TEST OF SIGNIFICANCE FOR LARGE SAMPLES:
Test of significance of single mean, Test of significance of difference of two means, Difference between two standard deviation, Test for single proportion, test of significance for difference of two proportions, Confidence intervals.
Book 1, Chapter 12, Sections 12.8 -12.9.2, 12.13 – 12.15.

TEST OF SIGNIFICANCE FOR SMALL SAMPLES:
t- Test – Test for single mean, test of significance for difference between two population means, t-Test for paired observations, F- test.
Book 1 Chapter 14 Sections 14.1-14.2.7, 14.3.2   **(40 Hours)**

UNIT III : CHI-SQUARE TEST:
Chi-square test for homogenity, Chi-square test of Goodness of Fit, Test of independence of two attributes.

Book 1   Chapter 11 Sections 11.7 – 11.8
Chapter 13 Sections 13.5.2, 13.5.3   **(10 Hours)**

UNITIV : ANALYSIS OF VARIANCE:

ANOVA – One way classification, Two way classification
Chapter 17   Sections 17.1 – 17.3   **(10 Hours)**

PRACTICAL COMPONENT
UNIT V: COMPUTATIONAL STATISTICS USING "R" SOFTWARE

Measures of central tendency : Mean ,Median & Mode. Skewness and Kurtosis Fitting of   distribution Binomial, Poisson and Normal.Chi-Square test of Goodness of fit Test of Significant differencebetween two means and two proportions .
Paired t- test,ANOVA one way classification.

(Internal Practical only, No questions for the end semester examination)
Book 2   **(15 Hours)**

BOOKS RECOMMENDED:

1. S.C. Gupta and V.K Kapoor, Elements of Mathematical Statistics, Third edition (2015), Sultan Chand & Sons , New Delhi **.**
2. Sudha G.Purohit, Sharad D.Gore and Shailaja R. Deshmukh, Statisitcs using R , Second edition (2015) ,Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. P.R. Vittal, Mathematical Statistics (2002), Margham Publications, Chennai.
2. S.C. Gupta and V.K. Kapoor, Fundamentalsof Mathematical Statistics Eleventh edition (2002), Sultan Chand & Sons Publications, New Delhi.
3. Robert V. Hogg, Joseph Mckean & Craig A.T ,Introduction to Mathematical Statistics, (2013), Pearson Education India.
4. George W. Snedecor , William G.Cochran, Statistical Methods (1967),Oxford & IBH Publishers,
5. Dr.S.P. Gupta, Statistical Methods ,41st edition (2011) ,Sultan Chand & Sons , New Delhi .

JOURNALS

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E- LEARNING RESOURCES:

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2. **http://www.opensource.org**
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4. **http://www.in.ixl.com**
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SEMESTER V COURSE PROFILE

COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS/ WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL

MA18/5C/LAL	Linear Algebra	4	5	75	3-2-0	40	60	100
MA18/5C/RAN	Real Analysis	4	5	75	3-2-0	40	60	100
MA18/5C/STT	Statics	4	6	90	3-3-0	40	60	100
MA18/5C/OPT	Optimization Techniques	4	5	75	3-2-0	40	60	100
MA18/5E/PLC	Programming Language 'C'	3	6	90	2-4-0	40	60	100
MA18/5E/PR1	Programming Language 'C' (Practicals)	2	3	45	0-0-3	-	10 90	100

SEMESTER -V
LINEAR ALGEBRA

TOTAL HOURS: 75 Hours **COURSE CODE: MA18/5C/LAL**
CREDITS: 4 **L- T- P: 320**

COURSE OBJECTIVES:

To enable students to
1. Understand the fundamental concepts of linear algebra.
2. Analyze and understand theorems on Vector space and linear transformation
3. Find the linear span and basis of vector space.

COURSE OUTLINE:

UNIT I: VECTOR SPACES
Basic concepts-Definition-Examples-Homomorphism-Internal
Direct Sum-External Direct Sum.
Book 1 Chapter 4 section 4.1   **(15 Hours)**

UNIT II: VECTOR SPACES (contd.)
Linear dependence and independence of vectors,Linear Span , Bases
Dimensions of Vector Spaces, Inner Product space
Book 1 Chapter 4 section 4.2, 4.4   **(15 Hours)**

UNIT III: LINEAR TRANFORMATION
Algebra of Linear transformation, Regular and Singular Linear Transformations
Rank of Linear Transformation.
Book 1 Chapter 6 section 6.1(15Hours)

UNIT IV: LINEAR TRANSFORMATION (contd.)
Characteristic Roots, Characteristic Vectors, Matrices.
Book 1 Chapter 6 sections 6.2, 6.3.   **(15 Hours)**

UNIT V: APPLICATIONS OF VECTOR SPACES AND LINEAR TRANSFORMATION
Applications based on the concept of
a. linear dependence and independence of vectors, linear Span , bases and dimensions
of Vector Spaces.
b. Linear transformation, Characteristic Roots, Characteristic Vectors & Matrices.
Book 2 Chapter 3 Sections 3.1-3.5, chapter 5 sections 5.1 – 5.3 & 5.9 (problems only)
(15 Hours)
BOOKS RECOMMENDED

1. I.N. Herstein ,Topics in Algebra ,2nd edition (1989) ,Wiley Eastern Ltd. New Delhi.

2. N.S. Gopalakrishnan, University Algebra, New Age international (P) Limited,

   Publishers.

REFERENCE BOOKS:
1. K. Hoffmann and R. Kunze, Linear Algebra, 2nd Edition (2005),Prentice-Hall of India.

2. M. Artin, Algebra (2005), Prentice-Hall of India.

3. S. Axler, Linear Algebra Done Right, 2nd Edition (1999), John-Wiley, New York.

4. S. Lang, Linear Algebra (1997), Springer UTM.

5. S. Kumaresan, Linear algebra: A Geometric Approach (2004), Prentice-Hall of India.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.

2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. <u>http://www.mathforum.org</u>

2. <u>http://www.opensource.org</u>

3. <u>http://khanacademy.org</u>

4. <u>http://in.ixl.com</u>

5. <u>http://www.learningwave.com</u>

SEMESTER -V

REAL ANALYSIS

TOTAL HOURS: 75 Hours   **COURSE CODE: MA18 / 5C RAN**
CREDITS: **4**   **L-T- P: 3 2 0**

COURSEOBJECTIVES:

To enable students to
1. Get acquainted with analytic approach of real numbers.
2. Explore sequence and series, the various limiting processes viz. continuity, differentiability and integrability.
3. Understand the topological properties of a metric space.

COURSE OUTLINE:

UNIT I: Countability, Real numbers, least upper bounds, sequences and sub sequences, limit of a sequence, convergent and divergent sequence, bounded sequences, Monotone sequences, Cauchy sequences.
Chapter 1 sections 1.5 - 1.7
Chapter 2 sections 2.1 - 2.8, 2.10   **(15 Hours)**

UNIT II: Convergence and divergence of series, series of non-negative terms, alternating Series, conditional and absolute convergence. test for absolute convergence .
Chapter 3 sections 3.1 - 3.4 , 3.6   **(15 Hours)**

UNIT III: Limit of a function, metric spaces, functions continuous at a point on a real line, Open sets, closed sets.
Chapter 4 sections 4.1 , 4.2
Chapter 5 sections 5.1 - 5.5   **(15 Hours)**

UNIT IV: Connectedness and Completeness

Connectedness, Bounded sets and totally bounded sets, completeness .
Chapter 6 sections 6.1-6.4   **(15 Hours)**

UNIT V: Compactness.
Calculus: Sets of measure zero, Definition of Riemann integral, Existence of
Riemann integral.
Chapter 6 section 6.5
Chapter 7 sections 7.1 - 7.3   **(15 Hours)**

BOOKS RECOMMENDED:

1. Richard .R .Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co., Pvt . Ltd, New Delhi .
2. Tom. M. Apostol , Mathematical Analysis, Narosa Publishing house , 2nd edition (1974), Addison-Wesley publishing company , New Delhi.

REFERENCE BOOKS:

1. Rudin W. Principles of Mathematical Analysis (1976),Tata Mc Graw Hill company, New York.
2. Malik. S. C & Savita Arora, Mathematical Analysis (1991),Wiley eastern Limited, New Delhi.
3. Sanjay Arora & Bansi Lai ,Introduction to Real Analysis (1991), Satya Prakashan , NewDelhi.
4. Gelbaum .B.R & Olmsted, Counter Examples in Analysis (1964) ,Holden Day, San Fransis Co.
5. A. L. Gupta & N. R. Gupta, Principles of Real Analysis (2003), Pearson Education (India Print).

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.,
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

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SEMESTER - V
STATICS

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TOTAL HOURS: 90   **COURSE CODE: MA18/5C/STT**

CREDITS: 4   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

To enable students to
1. Understand the basic concepts of forces and friction acting on a static body.
2. Study the equilibrium of a particle and momentum of force acting on a rigid body.
3. Get familiarised with the concepts of couple and evaluate mass centre .

COURSE OUTLINE:

UNIT I: Forces: Linear Momentum-Friction-Laws of Friction-angle and Cone of
Friction-Resultant of two, three and several forces acting on a particle.
Chapter 2 Section 2.1, 2.2   **(15 Hours)**

UNIT II: **Equilibrium of a Particle:** Triangle Law of forces and its Converse - Lami's
Theorem, Equilibrium of a particle under several forces-Limiting Equilibrium of a
particle on an Inclined Plane.
Chapter 3 Section 3.1, 3.2   **(15 Hours)**

UNIT III: Forces on a Rigid Body: Moment of a force-General Motion of a Rigid Body -
Equation of motion of a rigid body (statement only)-Equivalent Systems of forces-
Resultant of Like and Unlike parallel forces- Varignon's theorem-Forces along
the sides of a triangle
Chapter 4 Section 4.1, 4.2, 4.3, 4.4, 4.5   **(20 Hours)**

UNIT IV: **Couples:** Moment of a couple - Arm and axis of a couple - resultant of several
coplanar forces - Moment of a certain couple as area - Couples in a parallel plane
Resultant of a couple and a force - Equation of the line of action of the resultant.
Chapter 4 Section 4.6, 4.7, 4.8.   **(22 Hours)**

UNIT V: Centre of Mass: Centre of Gravity (C.G) - CG of a plane area - CG of an arc of a
Circle - segment of a circle - CG of solid and hollow cone - Solid and Hollow
hemisphere.
Chapter 6 Section 6.1, 6.2 (Omit 6.2.3 and 6.2.4)   **(18 Hours)**

RECOMMENDED TEXTBOOKS:

Duraipandian, P., Laxmi Duraipandian, MuthamizhJayapragasam, Mechanics ,6th Revised

Edition (2005), S. Chand and Company Ltd, New Delhi.

REFERENCE BOOKS:
1. A.V. Dharmapadam, Statics (2006), S.Viswanathan printers and publishers ltd
Chennai.,
2. Viswanath Naik, K & M.S. Kasi ,Statics**,** First edition (1987), Emerald Publishers
Chennai.

3. S.G. Venkatachalapathy , Statics ,First edition (2005), Margham Publications, Chennai-17
4. Golden Maths Series , Statics, N.P.Bali, Firewall Media , An Imprint of laxmi Publications Pvt. Ltd, New Delhi .
5. A.R.Vasishtha & R.K .Gupta, Statics , Krishna's Educational Publishers, Meerut.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://khanacademy.org**
4. **http://in.ixl.com**

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SEMESTER - V
OPTIMIZATION TECHNIQUES

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TOTAL HOURS: 75   **COURSE CODE: MA18/5C/OPT**
CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

To enable students to

1. Formulate a real time problem as a classical linear programming model and solve it.
2. Find the optimum allocation of number of jobs to equal number of facilities.
3. Serve the Customers as per the servers available using queuing models.

COURSE OUTLINE:

UNIT I : LINEAR PROGRAMMING
General LPP- Mathematical formulation - Solution for LPP by Graphical Method and Simplex Method (finite optimal solution, unbounded solution, alternative optimal solution) - slack and surplus variables.   **(15 Hours)**

UNIT II : ARTIFICIAL VARIABLE TECHNIQUE
Big-M Method - concept of Duality - Dual theorem (only statement) - Reading solution of the dual from the final simplex table of the primal and vice-versa.
                                                                     (15 Hours)

UNIT III: TRANSPORTATION PROBLEM
Mathematical formulation - North-West corner rule - Least cost Method - Vogel's approximation method - Optimality test.   **(15 Hours)**

UNIT IV: ASSIGNMENT PROBLEM

Hungarian method of solving an assignment problem - Unbalanced assignment problems - Travelling Salesman (routing) problem.   **(15 Hours)**

UNIT V : QUEUING THEORY

General concepts and definitions - classification of queues - Poisson process- properties of Poisson process, Models

i.   (M/M/1) : ($\propto$/ FCFS)
ii.   (M/M/1) : (N/ FCFS)
iii. (M/M/S) : ($\propto$/ FCFS)   **(15 Hours)**

BOOKS RECOMMENDED:

1. Kanti Swarup, P.K. Gupta, Man Mohan, Operations Research, 18th Edition (2015), Sultan Chand & Sons, New Delhi.
2. S.D. Sharma, Operations Research, 17th edition (2014), Kedhar Nath Ram Nath & co, New Delhi.

REFERENCE BOOKS:

1. R.K. Gupta, Operations Research, 18th edition (2003), Krishna Prakashan Media (P) Ltd, Meerut.
2. Gupta P.K & Hira D.S ,Problems in Operations Research (2000), S. Chand & Co, New Delhi.
3. Hamdy A. Taha, Operations Research: An Introduction, 7th edition (2004), Prentice Hall of India Ltd(P), New Delhi.
4. V. K. Kapoor, Operations Research Techniques for Management, 7th edition (2001), Roopak Printers, New Delhi .
5. V.Sundaresan, K.S. Ganapathy Subramanian & K. Ganesan, Resource Management Techniques (Operations Research) Tenth edition (2016), A.R. Publications, Nagapattinum District.

JOURNALS

1. Mathematics Newsletter.
2. Discrete Mathematical Sciences and Cryptography.

E- LEARNING RESOURCES:

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3. http://khanacademy.org
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SEMESTER – V

PROGRAMMING LANGUAGE 'C'

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COURSE OBJECTIVES:

To enable students to

1. Develop programming skill in 'C' language.
2. Understand the basic concepts of Operators and expressions in C – Language.
3. Get familiarized with the concepts of arrays and functions in C- programming.

COURSE OUTLINE:

UNIT I : About C – Introduction – Importance – programming structure data types and
Variables – character set – C tokens – keywords & identifiers – constants –
Variables –Data types – declaration – assigning values to the variables.
Chapter 1 Sections 1.1-1.4
Chapter 2 Sections 2.1-2.9   **(10 Hours)**

UNIT II: Operators and expressions: Arithmetic, Relational, Logical, Assignment,
Increment/Decrement, Conditional Bitwise operators, Precedence of Arithmetic
Operators – Arithmetic expressions, Evaluation of expressions, Type conversions
in expressions, Input/output operations, Reading/Writing a character – formatted
Input/output.
Chapter 3 Sections 3.1-3.14
Chapter 4 Sections   4.1-4.5   **(15 Hours)**

UNIT III: Control Statements –Decision making and Looping: While, do-while, for,
Nested Loop – jump in Loops.
Decision Making and branching: if else – switch, break and continue, goto
statements.
Chapter 5 & Chapter 6   **(20 Hours)**

UNIT IV: Array: One and Two dimensional arrays – initializing two dimensional arrays
Strings: Handling of character strings – declaring and initializing string variables
Reading strings from the terminal – Writing strings to screen – Arithmetic
Operation on characters – Putting strings together – Comparison of strings –
String handling functions.
Chapter 7 Sections 7.1-7.4
Chapter 8 Sections 8.1-8   **(30 Hours)**

UNIT V: Functions: Defining, Accessing – Passing arguments to functions –
Specifying Argument data types – The scope and Life time of variables in
functions – Recursion.
Chapter 9 Sections 9.1-9.15 (Omit 9.14)   **(15 Hours)**

RECOMMENDED TEXT BOOKS:

E.Balaguruswamy ,Programming in ANSI C, Edition 2.1(2002) , Tata Mc-Graw Hill Publishing Company Limited , New Delhi. (Case Study Excluded),

REFERENCE BOOKS:

1. Bryon S. Gottfried , Programming with 'C' ,Schaum's outlines, 3rd edition (1998), Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

2. Yashavant P.Kanetkar, Let us C, 12th edition (2012) BPB Publications, New Delhi.

3. T.Veerarajan,T.Ramachandran ,Numerical Methods With Programs in C,2nd edition(2006) Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

4. Paul Deitel, Harvey Deitel, C How to Program, 8[th]Edition (2015), Pearson Publication, New Delhi.

5. Anita Goel, Ajay Mittal, Computer Fundamentals and Programming in C (2013), Pearson Education, New Delhi.

JOURNALS:

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SEMESTER – V
PROGRAMMING LANGUAGE C – PRACTICALS

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TEACHING HOURS : 45   **COURSE CODE :MA18 /5E /PR1**
CREDITS:2   **L -T- P : 0 0 3**

PRACTICAL PROGRAMS

1. Program to find roots of a quadratic equation.
2. Program to reverse the digits of a number and also to find their sum.
3. Program to generate prime numbers between any two given numbers.
4. Program to find the GCD & LCM of two numbers.
5. Program to find integer power of a number.
6. Program to evaluate $1 + x + x^2 + x^2 +... + x^n$.
7. Program to read the cost price and selling price and calculate the Profit or loss and also the loss percentage or profit percentage.
8. Program to print election result after checking the eligibility of age.

9. Program to calculate mean and standard deviation of a given set of numbers using arrays.
10. Program to sort a given set of numbers in ascending order by interchange sort.
11. Program to find the transpose and trace of a matrix.
12. Program to find matrix addition and subtraction.
13. Program to find multiplication of matrices.
14. Program to assign grade to the average mark obtained by a student.
15. Program to accept a line of text and to count the number of vowels, consonants and special characters and number of words in the text.
16. Program to get a string and check it for a Palindrome using string handling function and without string handling function.
17. Program to get two strings and concatenate the strings and get the length of the strings.
18. Program using function sub- program, ternary operator and recursive function to find the factorial of a given number.
19. Program using function, to find the binomial co-efficient for a given n and r.
20. Program using function, to generate Fibonacci series.

RECOMMENDED TEXT BOOKS:

E.Balaguruswamy ,Programming in ANSI C, Edition 2.1(2002) , Tata Mc-Graw Hill Publishing Company Limited , New Delhi. (Case Study Excluded)

REFERENCE BOOKS:

1. Bryon S. Gottfried , Programming with 'C' ,Schaum's outlines, 3rd edition (1998), Tata Mc-Graw Hill Publishing Company Limited, New Delhi.
2. Yashavant P.Kanetkar, Let us C, 12th edition (2012) BPB Publications, New Delhi.
3. T.Veerarajan,T.Ramachandran ,Numerical Methods With Programs in C,2nd edition(2006) Tata Mc-Graw Hill Publishing Company Limited, New Delhi.
4. Paul Deitel, Harvey Deitel, C How to Program, 8thEdition (2015), Pearson Publication, New Delhi.
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Assessment: Computer Practical Examination.

Duration - 3 Hours

Maximum marks 100 (Aggregate of examination and record);

Practical examination – 90 (3 x 30) Marks.

Record -10 Marks

There will be three questions with or without subsections to be asked for the practical examination.

Assessment of Computer Practical Examination.

For each question

Programming skill (writing)   - 10 marks

Technical Skill   (Keying)   - 10 marks

Debugging and generating output   - 10 marks

Two **internal examiners** (appointed in consultation with Head of the department / Principal of the college) to be appointed to conduct the practical examination.

SEMESTER VI COURSE PROFILE

COURSE CODE	TITLE OF THE PAPER	CREDITS	HOURS /WK	TOTAL HOURS	L-T-P	CA	SA	TOTAL
MA18/6C/CAN	Complex Analysis	4	5	75	3-2-0	40	60	100
MA18/6C/DYN	Dynamics	4	6	90	3-3-0	40	60	100

MA18/6C/DIM	Discrete Mathematics	4	5	75	3-2-0	40	60	100
MA18/6E/OPR	Operations Research	5	5	75	4-1-0	40	60	100
MA18/6E/PCO	Programming Language 'C' & Introduction to OOP	3	6	90	2-4-0	40	60	100
MA18/6E/PR2	Programming Language'C'& Introduction to OOP (Practicals)	2	3	45	0-0-3	-	10 90	100

SEMESTER- VI
COMPLEX ANALYISIS

TOTAL HOURS: 75   **COURSE CODE: MA18 / 6C /CAN**
CREDITS: 4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

To enable students to

1. Get introduced to analytic functions.
2. Expand complex function using Taylor & Laurent Series.
3. Evaluate complex integrals using residues.

COURSE OUTLINE:

UNIT I:ANALYTIC FUNCTIONS
Functions of complex variables – Limit, continuity – Uniform Continuity – Analytic function – Cauchy-Riemann equations.

Chapter 2 Sections 12 – 26. (12 Hours)

UNIT II:TRANSFORMATIONS

Definitions – Definition of Conformal Mapping – Necessary and sufficient conditions for conformal mapping –Bilinear Transformation w = az+b / (cz+d) , w = 1/z
Chapter 8 Sections 90 – 94, Chapter 9 Section 101. (15 Hours)

UNIT III: COMPLEX INTEGRATION

Rectifiable arcs, Contours – complex line integration – Cauchy's theorem,Cauchy Goursat theorem (statement only) – Cauchy's Integral formula - Cauchy's integral formula for first order derivative – Extension of Cauchy's integral formula (without proof). Liouville's Theorem, Fundamental Theorem of Algebra, (simple problems)
Chapter 4 Sections 39 – 41, 46, 48 – 53. (18 Hours)

UNIT IV: Taylor and Laurent Series (statement only), Residue Calculus – Zeros and Poles of a function – Meromorphic function – The Residue at a pole – Residue Theorem Argument principle – Rouche's Theorem, (simple problems)
Chapter 6 Sections 68 – 76 (omit 71) & Chapter 7 Sections 86 – 87. (15 Hours)

UNIT V: CONTOUR INTEGRATION: Evaluation of

(i) $\int$ f (cosθ , sinθ) dθ

(ii) $\int$ f(x) dx where f(x) is a rational polynomial having no poles on the Real Axis

(iii) $\int$ f(x) sin mx dx & (iv) $\int$ f(x) cos mx dx,
where m > 0 and f(x) is a rational function having no poles on the Real Axis.
Chapter 7 Sections 78 – 81, 85. (15 Hours)

BOOKS RECOMMENDED:

1. R.V. Churchill and J.W Brown, Complex variable and application, 5th edition (1990), Mc Graw Hill International Book Co., New York.
2. H.A. Priestley, Introduction to Complex Analysis, 2nd Edition (2006), Oxford Indian).

REFERENCE BOOKS:

1. S. Ponusamy,Foundation of Complex Analysis (2000), Narosa Publishing House, New Delhi.
2. B.S.Tyagi ,Functions of a Complex Variable (2018), Kedar Nath and Ram Nath Publishers, Meerut.
3. S.Arumugam , A. Thangapandi Isaac, A. Somasundaram, Complex Variable , Scitech Publications, Chennai.
4. P. Duraipandian and Laxmi Duraipandian ,Complex Analysis (1976), Emerald Publishers, Chennai.
5. L.V.Ahlfors, Complex Analysis, 3rd Edition (2000), Mc Graw Hil Publishing Company Pvt. Ltd, New Delhi.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://www.khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

SEMESTER VI

DYNAMICS

TOTAL HOURS: 90   **COURSE CODE: MA18/6C/DYN**
CREDITS: 4   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

To enable students to

1. Understand the fundamental concepts of velocity and acceleration.
2. Understand the Work done in stretching an elastic string Simple Harmonic motion.
3. Study the motion of Projectiles, Impact of Spheres and Central Orbits.

COURSE OUTLINE:

UNIT-I: Kinematics: Velocity-resultant Velocity- relative velocity-Acceleration-velocity and
acceleration in a coplanar motion-Angular Velocity-Relative angular velocity.
Chapter 1 Sections 1.1, 1.2, 1.3, 1.4.   **(18 Hours)**

UNIT-II: Work, Energy and Power: Units of work- work done in stretching an elastic string-
Energy- Conservation of Energy-Power. Rectilinear motion under varying force-
Simple harmonic motion- composition of two simple harmonic motions.
Chapter 11 & 12 - Sections 11.1, 11.2, 11.3, 12.1 only (Omit 12.2, 12.3, 12.4).
(12 Hours)

UNIT-III: Projectiles: Forces on a projectile-Nature of trajectory-Results pertaining to the
motion of a projectile-Maximum horizontal range for a given velocity- Two
trajectories with a given speed and range- projectile projected horizontally and on an
inclined plane-Maximum range on an inclined plane.
Chapter 13 Sections 13.1, 13.2 only (Omit 13.3)

Impact: Impulsive force-Laws of impact- Direct and oblique impact of two smooth
Spheres- Impulse loss of kinetic energy due to impact.
Chapter 14   Sections 14.1, 14.2, 14.3, 14.5 (Omit 14.4)   **(27 Hours)**

UNIT-IV: Central Orbits: General Orbits- central force- differential equation of a central orbit-
Laws of central force-method to find the central orbit-Conic as a central orbit- Kepler's
law of planetary motion.

UNIT-V: **Moment of Inertia:** Moment of two dimensional and solid bodies, Radius of Gyration,Perpendicular and parallel axes theorem.
            Chapter 17 Section 17.1   **(18 Hours)**

RECOMMENDED TEXTBOOKS:

Duraipandian, P., Laxmi Duraipandian, MuthamizhJayapragasam, Mechanics ,6th Revised Edition (2005), S. Chand and Company Ltd, New Delhi.

REFERENCE BOOKS:

1. A.V Dharmapadam, Dynamics, Fifth edition (1996), S.Viswanathan Printers & Publishers Pvt Ltd.

2. Dr.Viswanath Naik, K & M.S. Kasi ,Dynamics**,** First edition (1987), Emerald Publishers Chennai.

3. Prof S.G. Venkatachalapathy , Dynamics, First edition (2005) ,Margham Publications, Chennai-17.

4. Golden Maths Series , Dynamics, N.P.Bali, Firewall Media , An Imprint of laxmi Publications Pvt. Ltd, New Delhi .

5. A.R.Vasishtha & R.K .Gupta, Dynamics, Krishna's Educational Publisher, Meerut..

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1. **http://www.mathforum.org**
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SEMESTER – VI
DISCRETE MATHEMATICS

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TOATL HOURS: 75 HOURS   **COURSE CODE : MA18/6C/DIM**
CREDITS :4   **L-T-P: 3 2 0**

COURSE OBJECTIVES:

To enable students to

1. Develop construction and verification of mathematical Statements.
2. Gain fundamental knowledge about lattices and Boolean Algebra.
3. Learn the basics of Graph Theory and its application.

COURSE OUTLINE :
UNIT I : PROPOSITIONAL CALCULUS
Tautology and contradiction - Equivalence of formulae - Equivalent formulae -duality law – Tautological implications – Functionally complete set of connectives – other connectives- Normal forms – disjunctive normal forms – conjunctive normal forms.
Book 1 Chapter 4   **(12 Hours)**

UNIT II: RELATIONS and LATTICES
Basic concepts – Binary Relations – Properties of binary relations – Equivalence relations –Partial ordering –partially ordered set – Hasse diagram. Lattices – Introduction- Principle of duality - Properties of Lattices – sub Lattice – distributive lattice, modular lattice – bounded lattice - complemented lattice.
Book 1 Chapter 5, 6 and 7   **(15 Hours)**

UNIT III:BOOLEAN ALGEBRA
Definition – Other basic laws of Boolean Algebra – Principle of duality for Boolean Algebras – ATOM definition - ATOMIC Boolean algebra – Finite Boolean Algebra. Boolean expression – definition – Boolean function – Literal – minterm and maxterm, Normal forms and Canonical forms – Simplification of Boolean functions by Karnaugh Map method.
Book 1 Chapter 8,9 and 10   **(18 Hours)**

UNIT IV: GRAPHS, SUBGRAPHS AND CONNECTEDNESS
Introduction – definition and examples – degrees – subgraphs – Isomorphisms – walks, trails and paths – connectedness and components – blocks – connectivity.
Book 2 Chapter 2 section 2.0-2.4
Chapter 4 section 4.0-4.4   **(15 Hours)**

UNIT V: EULERIAN AND HAMILTONIAN GRAPHS
Introduction - Eulerian graphs – Hamiltonian graphs.
Book 2 Chapter 5   **(15 Hours)**

BOOKS RECOMMENDED :

1. Dr.S.P. Rajagopalan, Dr.R.Sattanathan, Discrete Mathematics (2007), Margham Publications Chennai -17.
2. S.Arumugam, S.Ramachandran: Invitation to graph theory (2008), Scitech Publications (India) Pvt.ltd , Chennai -17.

REFERENCE BOOKS:

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science (2004), Prentice-Hall of India.
2. Trembley J.P and Manohar .R , Discrete Mathematical Structures with Applications to Computer Science (2003), Tata Mcgraw – Hill Publication Co., limited, New Delhi.

3. Ralph.P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction 4th edition (2002), Pearson Education Asia, Delhi.
4. Dr.M.K.Venkataraman , Dr.N.Sridharan, Dr.N.Chandrasekaran, Discrete Mathematics (2003), The National Publishing Company, Chennai.
5. Prof.V.Sundaresan, K.S.Ganapathy Subramanian , K.Ganesan ,Discrete Mathematics , , New Revised edition (2000),A.R.Publications , Tamil Nadu.

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1. **http://www.mathforum.org**

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SEMESTER - VI

OPERATIONS RESEARCH

TOTAL HOURS: 75 HOURS　　　　　　　　　**COURSE CODE: MA18/ 6E/OPR**
CREDITS: 5　　　　　　　　　　　　　　　　**L-T-P: 4 1 0**

COURSE OBJECTIVES:

To enable students to
1. Determine the optimum sequence to complete n jobs through two or three machines in minimum time.
2. Understand the need for inventory and to compute the optimum size of inventory .
3. Represent a real time problem using Network Diagram and find its critical path using CPM & PERT techniques.

COURSE OUTLINE:

UNIT I: SEQUENCING PROBLEMS
Introduction - n jobs to be operated on two machines - n jobs to be operated on three Machines - sequence decision problem for n jobs on m machines - problem involving two jobs and m machines - Graphical method.

(10 Hours)

UNIT II: GAME THEORY
Two persons zero sum games, the maxmin-minmax principle - saddle point and value of games - games without saddle points-pure strategies and mixed strategies - properties of optimal mixed strategies(without proof) - Dominance property - graphical method for 2 x n and m x 2 games. **(10 Hours)**

UNIT III: INVENTORY THEORY

Introduction- variables in an inventory problem - Need of inventory- Inventory problems - Advantages and disadvantages of inventory-
Classification of inventory Models - Economic lot size models
Model I: Economic lot size model with uniform rate of demand, infinite rate of production and no shortages.
Model II: Economic lot size model with uniform rate of demand, finite rate of replenishment having no shortages. **(20 Hours)**

UNIT IV: NETWORK ANALYSIS
Introduction - Network diagram representation - rules for drawing
Network diagram - labelling: Fulkerson's 'I-J' rule - time estimates and critical path in Network analysis - Forward pass, Backward pass computation - Determination of floats and slack times - Determination of critical path. (**20 Hours**)

UNIT V: PROJECT EVALUATION AND REVIEW TECHNIQUES (PERT)
Optimistic time - most likely time - Pessimistic time- expected time - variance - Rules for finding variance of events - problems in PERT.

(15 Hours)

BOOKS RECOMMENDED:

1. Kanti Swarup, P.K. Gupta, Man Mohan, Operations Research, 18th Edition (2015), Sultan Chand & Sons, New Delhi.
2. S.D. Sharma, Operations Research, 17th edition (2014), Kedhar Nath Ram Nath & co, New Delhi.

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1. R.K. Gupta, Operations Research, 12th edition, Krishna Prakashan Media (P) Ltd.
2. Gupta P.K & Hira D.S Problems in Operations Research, First edition (2003), S. Chand & Co, Delhi.
3. Hamdy A. Taha, Operations Research: An Introduction, 7th edition, 2004, Prentice Hall of India Ltd(P), New Delhi.
4. V. K. Kapoor, Operations Research Techniques for Management, 7th revised edition (jan 2001), Roopak Printers, Delhi – 32.
5. V. Sundaresan, K.S. Ganapathy Subramanian & K. Ganesan, Resource Management Techniques (Operations Research), Reprint June 2002, A.R. Publications, Nagapattinum District.

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SEMESTER – VI
PROGRAMMING LANGUAGE 'C' & INTRODUCTION TO OOP

COURSE OBJECTIVES:

To enable students to

1. Develop programming skill in C++.
2. Get Familiarised the fundamental concepts of Structures , Pointers & File Management.
3. Acquire knowledge about dynamic memory allocation & linked lists.

COURSE OUTLINE:

UNIT I: Structures: Structure definition giving values to members – structure initialization,
        Arrays of Structures – Arrays within Structures – Structures within structures
        Book 1 Chapter 10 Section 10.1-10.8   **(20 Hours)**

UNIT II: Pointers: Understanding Pointers – Accessing address of a variable – Declaring
         and Initializing pointers – Accessing a variable through its pointer – Pointers and
        Arrays-Pointers and Structures
        Book 1Chapter 11 Section 11.1-11.8   **(20 Hours)**

UNIT III: File Management: Defining and opening a file – Closing a file – Input / Output,
        operations on files. Random access to files.
        Book 1 Chapter 12 Section 12.1-12.6   **(10 Hours)**

UNIT IV: Dynamic Memory Allocation and Linked Lists: Introduction –Dynamic
        Memory allocation,concepts, advantages and types of linked list Representation
        of Linked Lists in memory. Creation of a linked list. Insertion into Linked List –
        Deletion from a Linked List.**(programs not included**)
        Book 1 Chapter 13 Section 13.1-13.7   **(20 Hours)**

UNIT V: Concepts of OOP: Need for object oriented programming, Procedural languages,
        Object oriented approach, Characteristics of object oriented Languages. Objects,
        classes, inheritance, reusability, creating new data types, polymorphism and over
        loading,
        Introduction to C++: Name space, Input/output operator , iostream files
        Comparison of C with C++, simple programs in C++.
        Book 2 Chapter 1& Chapter 2   **(20 Hours)**

RECOMMENDED TEXT BOOKS:

1. E.Balaguruswamy ,Programming in ANSI C, Edition 2.1(2002) , Tata Mc-Graw Hill Publishing
   Company Limited , New Delhi. (Case Study Excluded)
2. Object Oriented Programming with C++ , Sixth Edition, E.Balagurusamy, McGraw Hill
   Education India) Private Limited.

REFERENCE BOOKS:

1. Bryon S. Gottfried , Programming with 'C' ,Schaum's outlines, 3rd edition (1998), Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

2. Yashavant P.Kanetkar, Let us C, 12th edition (2012) BPB Publications, New Delhi.

3. T.Veerarajan,T.Ramachandran ,Numerical Methods With Programs in C,2nd edition(2006) Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

4. Paul Deitel, Harvey Deitel, C How to Program, 8thEdition (2015), Pearson Publication, New Delhi.

5. Anita Goel, Ajay Mittal, Computer Fundamentals and Programming in C (2013), Pearson Education, New Delhi.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography .

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

SEMESTER – VI
PROGRAMMING LANGUAGE 'C' & INTRODUCTION TOOOP
PRACTICALS

TOTAL HOURS: 45 HOURS   **COURSE CODE: MA18 /6E/PR2**

CREDITS:2   **L-T-P:0 0 3**

PRACTICAL PROGRAMS:

1. Program to exchange two strings using pointers.
2. Program using pointers to compute the sum and average of all numbers stored in an array.
3. Program to read a name, grade and ten test scores into a structure and print them with high, low and average score.
4. Program to get and print title, author and price of three books, using structures and pointers to structure variables
5. Program to generate pay bill o f an employee using structures and structure element.
6. Program to generate admission list using structures and structure element.
7. Program to generate Telephone bill using structures and structure element.
8. Program to interpolate using Newton – Gregory Forward interpolation formula.
9. Program to interpolate using Newton – Gregory Backward interpolation formula.
10. Program to solve a system of Linear Algebraic Equations by Gauss Elimination method.

11. Program to interpolate using Lagrange Interpolation formula.
12. Program to evaluate an integral using Simpson one third rule for Numerical Integration.
13. Program to read the data from the keyboard, write it to a file, called "INPUT", read the same data from the same file and to display it on the screen.
14. Program to create a file called DATA containing a series of integer numbers, to read these numbers and then to write all odd numbers to a file to be called ODD and all even numbers to a file to be called EVEN, read the Data stored in ODD and EVEN files and to display them on the screen.
15. Program to create a file of records of students and to read, update and write the contents of the file.

Program 16 – 20 Using C++
16. Program to get two numbers and find the sum. Also check whether the sum is odd or even.
17. Program to get two numbers and find the quotient & remainder when the greater number is divided by the smaller number.
18. Program to get the largest of three numbers.
19. Program to find the sum of natural numbers using for loop.
20. Program to find factorial of a given number.

RECOMMENDED TEXT BOOKS:

1. E.Balaguruswamy ,Programming in ANSI C, Edition 2.1(2002) , Tata Mc-Graw Hill Publishing Company Limited , New Delhi. (Case Study Excluded)
2. Object Oriented Programming with C++ , Sixth Edition, E.Balagurusamy, McGraw Hill Education India) Private Limited.

REFERENCE BOOKS:

1. Bryon S. Gottfried , Programming with 'C' ,Schaum's outlines, 3rd edition (1998), Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

2. Yashavant P.Kanetkar, Let us C, 12th edition (2012) BPB Publications, New Delhi.

3. T.Veerarajan,T.Ramachandran ,Numerical Methods With Programs in C,2nd edition(2006) Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

4. Paul Deitel, Harvey Deitel, C How to Program, 8thEdition (2015), Pearson Publication, New Delhi.

5. Anita Goel, Ajay Mittal, Computer Fundamentals and Programming in C (2013), Pearson Education, New Delhi.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. http://www.m_athforum.org
2. http://www.opensource.org

3. http://khanacademy.org
4. http://in.ixl.com
5. http://www.learningwave.com

Assessment: Computer Practical Examination.

           Duration - 3 Hours

           Maximum marks 100 (Aggregate of examination and record);

           Practical examination – 90 (3 x 30) Marks.

           Record -10 Marks

There will be three questions with or without subsections to be asked for the practical examination.

Assessment of Computer Practical Examination.

For each question

Programming skill (writing)   - 10 marks

Technical Skill   (Keying)   - 10 marks

Debugging and generating output   - 10 marks

Two **internal examiners** (appointed in consultation with Head of the department / Principal of the college) to be appointed to conduct the practical examination.

UG & PG - Allied Course Profile

Semester (I & II)

(Offered to Other Departments)

COURSE OBJECTIVES:

To enable students to
1. Get equip with the knowledge of matrices and its applications.
2. Understand the concept of reduction formula and integral calculus.
3. Know the principle & concepts of Trigonometry

COURSE OUTLINE:

UNIT I: Matrices: Eigen values and Eigen vectors, Cayley Hamilton Theorem (No proof) verification of Cayley Hamilton theorem, Inverse of a Matrix using Cayley Hamilton Theorem. **(17 Hours)**

UNIT II: Theory of equations: Roots of polynomial Equations, Symmetric functions of roots in Terms of coefficients, Transformation of equations, Formation of equations, Reciprocal Equations. **(20 Hours)**

UNIT III: Trigonometry: Expansions of Cos $n\theta$, Sin $n\theta$, Expressions of Cos θ, sin θ, tan θ in powers of θ, Hyperbolic functions and Inverse Hyperbolic functions. Real and imaginary parts of sin $(\alpha+i\beta)$, cos $(\alpha+i\beta)$, tan $(\alpha+i\beta)$, $\tan^{-1}(\alpha + i\beta)$. **(18 Hours)**

UNIT IV: Integral calculus: Bernoulli's formula, Reduction formulae $\int e^{ax}\cos bx\ dx$, $\int e^{ax}\sin bx\, dx$,$\int \sin^m x \cos^n x\ dx$ (m, n being positive integers), $\int x^m (\log x)^n\ dx$, $\int \cos^m x \cos nx\ dx$, $\int \cos^m x \sin nx\ dx$. **(20 Hours)**

 UNIT V: Fourier Series: Definition- Finding Fourier coefficients for a given periodic functions with period 2π- odd and even function- Half range series**. (15 Hours)**

BOOKS RECOMMENDED:

1. Narayanan and Manicavachagom Pillay, Ancillary Mathematics Book I (2000), II (2002), and III (1998) **, S.**Viswanathan Printers and publishers Private limited, Chennai.
2. Dr.A.Singaravelu, Allied Mathematics, 3rd Revised edition (2011), Meenakshi Agency, Chennai.

REFERENCE BOOKS:

1. P.R. Vittal, Allied Mathematics , 4th edition (2009), Margham Publications, Chennai.
2. P. Duraipandian and S. Udayabaskaran, Allied Mathematics ,Volume I & II ,Second edition (2000) ,Muhil Publishers, Chennai.
3. A.Singaravelu & R.Ramaa , Algebra and Trigonometry ,Volume- I, First edition (2003), Meenakshi Agency, Chennai.
4. P. Kandasamy and K. Thilagavathi, Mathematics for B.Sc ,Volume II, First edition (2004) , S.Chand & Co., New Delhi.
5. T.K Manicavachagam Pillay, T. Natarajan, K.S. Ganapathy ,Algebra vol-I (2003), S. Viswanathan Pvt.Ltd,

 JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

 E- LEARNING RESOURCES:

1.
2.
3.
4.
5.

SEMESTER - II
ALLIED MATHEMATICS- II
(for I Year Physics & Chemistry)

TOTAL HOURS: 90   **COURSE CODE: MA18 / 2A /AM2//**
                                                            MC18 / 2A /AM2

CREDITS: 5   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

To enable students to
1. Solve the different types of linear differential equations.
2. Apply Laplace Transform to solve differential equation.
3. Interpolate a value from a given set of data.

COURSE OUTLINE:

UNIT I : Ordinary Differential Equations: Linear differential equations with constant co-efficients, particular integral of polynomial and Ve^{mx}, where V is a polynomial or sin x or cos x.   **(20 Hours)**

UNIT II : Partial Differential Equations : Formation, Complete Integral, Four standard types, Lagrange's Equation, simple problems.   **(20 Hours)**

UNIT III: Laplace Transforms: Laplace Transforms of Standard functions, Simple theorems. (no proof) Inverse Laplace Transforms, solving first order differential equations with constant coefficients using Laplace transforms.

          (20 Hours)

UNIT IV: Vector Analysis: Introduction, operator∇, Gradient, Directional derivative, unit Normal to surface. Divergence and curl of vectors, solenoidal and irrotational vectors, the operator ∇^2 harmonic functions.   **(15 Hours)**

UNIT V: Interpolation – Newton's forward and backward formulae for interpolation (no proof) Lagrange's formula for interpolation (No Proof) – Simple problems**.**   **(15 Hours)**

BOOKS RECOMMENDED:

1. Narayanan and Manicavachagom Pillay, Ancillary Mathematics Book I (2000), II (2002), and III (1998) **, S.**Viswanathan Printers and publishers Private limited, Chennai.
2. Dr.A.Singaravelu, Allied Mathematics, 3rd Revised edition (2011), Meenakshi Agency, Chennai.

REFERENCEBOOKS:

1. P.R. Vittal, Allied Mathematics , 4th edition (2009), Margham Publications, Chennai.
2. P. Duraipandian and S. Udayabaskaran, Allied Mathematics ,Volume I & II ,Second edition (2000) ,Muhil Publishers, Chennai.
3. A.Singaravelu & R.Ramaa , Algebra and Trigonometry ,Volume- I, First edition (2003), Meenakshi Agency, Chennai.
4. S. Arumugham, Numeical methods, 2nd edition (2003). New Gamma publishing, Palayamkottai.
5. P.R. Vittal, Differential equation and Laplace Transformations , First edition (2004), Margham Publications, Chennai.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.

2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. **http://www.mathforum.org**

2. **http://www.opensource.org**

3. **http://khanacademy.org**

4. **http://in.ixl.com**

5. **http://www.learningwave.com**

SEMESTER – I

BUSINESS MATHEMATICS – I
(for I B. Com)

TOTAL HOURS: 90   **COURSE CODE: MA18/1A/BM1**
CREDITS: 5   **L-T- P: 3 3 0**

COURSE OBJECTIVES:

To enable students to

1. Be equipped with the knowledge of Matrices and its applications.
2. Be acquainted with the various rules of differentiation and integration.

3. Understand the basic concepts of Operations research that can be applied in real life situations with special reference to business.

COURSE OUTLINE:

UNIT I: MATRICES

Introduction,Types of matrices,Cayley Hamilton Theorem(no proof),Inverse of a matrix using Cayley Hamilton Theorem. Solution of simultaneous equations using Gauss Elimination Method.
Book 1 Chapter 2 Sections 1.1,1.2,16.3,16.4
Book 2 Chapter 20 Section 20.24   **(18 Hours)**

UNIT II: DIFFERENTIATION

First and second order derivative of a function of one variable, derivatives of power function,   product of two functions, quotient of two functions, derivative of logarithmic function, logarithmic differentiation. (Trigonometric functions excluded)Maxima and Minima-Application to Business Problems
Book 2 Chapter 17   Sections 17.1 to 17.8, 17.12, 17.19   **(20 Hours)**

UNIT III: INTEGRATION

Introduction, some standard integrals, integrals reducible to standard form, integration by parts, integration by partial fractions. (Trigonometric functions excluded)
Book 2 Chapter18 Sections18.1 to 18.4, 18.6 to 18.8,18.10   **(20 Hours)**

UNIT IV: LINEAR PROGRAMMING

General linear programming problem, Mathematical formulation of a LPP, Graphical procedure and Simplex procedure.(Excluding artificial variable).
Book 3 Chapter 6 Sec 6.1 to 6.3,6.10,6.11,6.22   **(18 Hours)**

UNIT V: GAME THEORY

Two persons zero sum games, the maximin-minimax principle, saddle point and Valueof the games, Games without saddle points, mixed strategies, Dominance property.
Book 3 Chap 12 Sec 12.5,12.9,12.10,12.12 to 12.15   **(14 Hours)**

BOOKS RECOMMENDED:

1. T.K Manicavachagam Pillay, T. Natarajan, K.S. Ganapathy ,Algebra vol-II (2004), S. Viswanathan Pvt.Ltd,Chennai.
2. D.C. Sancheti and V.K. Kapoor, Business mathematics,11th edition (1993), Sultan Chand & Sons ,New Delhi.
3**.** R.K. Gupta, Operations Research (2003), Krishna Prakashan Media Pvt Ltd, Meerut.

REFERENCEBOOKS:

1. Dr.P.R. Vittal, Business Mathematics, 3rd edition (2005), Margham Publications, Chennai.
2. S.P.Rajagopalan , R.Sattanathan , Business Mathematics(2009), Tata Mc Graw Hill Education Pvt Ltd, New Delhi.

3. Dr.S.K.Sharma , Dr.Gurmeet Kaur , Business Mathematics, 1st edition (2019), Sultan Chand & Sons ,New Delhi.
4. Prof. V. Sundaresan, Prof. K.S. Ganapathy Subramanian, Prof. K. Ganesan, Resource Management Techniques (Operations Research), 10th edition (2016), A.R. Publications, Chennai.
5. Kanti Swarup, P.K.Gupta, Man Mohan , Operations Research , 18th edition (2015), Sultan Chand & Sons ,New Delhi.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. **http://www.mathforum.org**

2. **http://www.opensource.org**

3. **http://khanacademy.org**

4. **http://in.ixl.com**

5. **http://www.learningwave.com**

KEY: STRONGLY CORRELATED-3 **M**ODERATELY CORRELATED-2 **W**EAKLY CORRELATED-1 **N**O CORRELATION-0

TEACHING METHODOLOGY:

1. Lecture (Chalk and Talk-OHP-LCD)
2. Problem Solving-Group Discussion
3. Quiz-Seminar
4. Peer Learning

SEMESTER – II

BUSINESS MATHEMATICS – II
(For I B.Com)

TOTAL HOURS: 90 HOURS   **COURSE CODE: MA18/2A/BM2**
CREDITS: 5   **L–T-P: 3 3 0**

COURSE OBJECTIVES:

To enable students to

1. Be acquainted with the knowledge of counting principles and its applications.
2. Find an optimum allocation of a number of jobs to equal number of facilities.
3. Select an appropriate order in which, to service, waiting customers.

COURSE OUTLINE:

UNIT I: PERMUTATION AND COMBINATION

Fundamental rule of Counting, Permutations, Factorial notation, Permutation of n different things, Circular Permutations, Permutation of things not all different, Restricted permutations, Combinations- Restricted Combination, Combination of things not all different.

Book1: Chapter 9 – Sections 9.1 to 9.11   **(20 Hours)**

UNIT II: ARITHMETIC AND GEOMETRIC PROGRESSION

Arithmetic progression, sum of series in AP, arithmetic mean, geometric progression, sum of series in GP, geometric mean.

Book1: Chapter12 – Sections 12.1 to 12.6   **(15 Hours)**

UNIT III: TRANSPORTATION PROBLEM

Introduction, Transportation problem, initial feasible solution, North-West corner Rule, Lowest cost method, Vogel′s method optimality test (only problems) degeneracy excluded.

Book2: Chapter 9 – Sections 9.1,9.2,9.6   **(20 Hours)**

UNIT IV: ASSIGNMENT PROBLEM

Introduction, Assignment problem-Hungarian method of solving an assignment problem -Unbalanced assignment problems-Travelling Salesman (routing)problem.

Book2: Chapter 8 – Sections 8.1,8.2,8.4,8.5.   **(15 Hours)**

UNIT V: SEQUENCING

Introduction - sequencing problems, general assumptions, sequencing decision problems for n-Jobs on two machines, sequencing decision problems for n-Jobs on three machines.

Book2: Chapter10 – Sections 10.1 to 10.5   **(20 Hours)**

BOOKS RECOMMENDED:

1. D.C. Sancheti and V.K. Kapoor, Business mathematics, 11th edition (1993), Sultan Chand & Sons , New Delhi.
2. R.K. Gupta, Operations Research (2003), Krishna Prakashan Media (P), Ltd, Meerut.

REFERENCE BOOKS:

1. Narasimhan, Ramachandran , Veeraragavan, Ramana, Business Mathematics and Business statistics, K.C.S. Desikan and Co.
2. P.R. Vittal, Business Mathematics, Margham Publications.
3. D.S. Hira & P.K. Gupta, Operations Research
4. KantiSwarup,P.K.Gupta,Manmohan, S.Chand Publications, Operations Research
5. Prof. V. Sundaresan, Prof. K.S. Ganapathy Subramanian, Prof. K. Ganesan, Resource Management Techniques,Meenakshi Publications.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. http://www.mathforum.org
2. http://www.opensource.org
3. http://khanacademy.org
4. http://in.ixl.com
5. http://www.learningwave.com

SEMESTER –I
BUSINESS MATHEMATICS
(for I B.Com Hons)

TOTAL HOURS: 75 HOURS   **COURSE CODE: MA18/1C/BMM**
CREDITS: 4   **L–T-P: 3 2 0**

COURSE OBJECTIVES:

To enable student to
1. Introduce and develop basic concepts of Mathematics.
2. Introduce business applications in Mathematics.
3. Understand the basic integration concepts.
4. Introduce parts of matrices and its applications.
5. Understand the concept of experiment, outcome, event, probability and equally likely.

UNIT – I : DIFFERENTIAL CALCULUS
Differentiation: Meaning, rules and interpretation of first and second order derivatives. Applications of Differentiation: Elasticity of demand, total and marginal revenue, maxima and minima of univariate functions – applications of maxima and minima to economics only.   **(15 Hours)**

UNIT – II : ALGEBRA
Permutation and combination, Arithmetic Progression, Geometric Progression
                     (15 Hours)

UNIT – III: INTEGRATION
Integration : Meaning , Rules of integration . Indefinite and definite integrals . Applications (Integration by substitution and by parts (Trigonometric functions excluded)   **(15 Hours)**

UNIT –IV: MATRICES
Matrices : Meaning and Operations – Matrix inversions – Solutions to linear equations – Payroll wages and Commission.
                     (15 Hours)

UNIT – V: PROBABILITY
Concept of Probability- Independent and mutually exclusive events- Addition rule for two or more mutually exclusive events- Multiplication rule for Probability – Bayes' Rule (Proof excluded).
                    (15 Hours)

RECOMMENDED TEXT:

1. D.C Sancheti and V.K .Kapoor, Business Mathematics (2006) ,Sultan chand & Sons, New Delhi.
2. P.R. Vittal, Business Mathematics (1999), Margham Publications, Chennai.

REFERENCE BOOKS:
1. B.M. Agarwal, Business Mathematics & Statistics(2001), Ane Books Pvt Ltd , New Delhi.
2. R.S.Soni , Business Mathematics(2013) , Ane Books Pvt Ltd ,New Delhi.
3. P.R. Vittal, Mathematical Foundations, Margham Publications, Chennai.
4. P.Mariappan, Business Mathematics, Pearson Publications, New Delhi.
5. Ken Black, Probability and Statistics for Business and Economics (2010), John Wiley and Sons publication, New York.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

SEMESTER –II
OPTIMIZATION TECHNIQUES
(for I B.Com Hons)

TOTAL HOURS: 75HOURS   **COURSE CODE: MA18/2C/OPT**
CREDITS: 4   **L –T-P: 3 2 0**

COURSE OBJECTIVES:

To enable students to
1. Understand the basic concepts of Operations Research.
2. Know how to apply maxmin-minmax principle in game theory.
3. Understand the special features in transportation problem.
4. Apply assignment techniques in real life situations.
5. Study various concepts in networks

UNIT I: LINEAR PROGRAMMING:

General linear programming problem. Mathematical formulation of a LPP.
Graphical procedure and Simplex procedure.(problems only)   **(15 Hours)**

UNIT II: GAME THEORY

Two persons zero sum games, the Maximin-Minimax Principle, Saddle point and
Value of the games, Games without saddle points, Mixed Strategies, Dominance
property.   **(15 Hours)**

UNIT III: TRANSPORTATION PROBLEM

Introduction, Transportation problem, Initial feasible solution, North-West Corner Rule,
Lowest cost method, Vogel's method, Test for Optimality. (problems only)
(Degeneracy excluded)   **(15 Hours)**

UNIT IV: ASSIGNMENT PROBLEM

Introduction, Assignment problem, Hungarian Assignment for solving minimal
assignment problem (problems only)   **(15 Hours)**

UNIT V: PERT AND CPM

Drawing network diagram, Critical Path Method, Concept of slack and floats on
network, Algorithm for PERT and CPM.   **(15 Hours)**

RECOMMENDED TEXT:

1. Prof. V. Sundaresan, K.S. Ganapathy Subramanian, K. Ganesan: Resource
   Management Techniques A. R. Publications.
2. S.Kalavathy, Operations Research.

REFERENCE BOOKS:

1. D. C. Sancheti and V.K. Kapoor, Business Mathematics,11th edition (1993),Sultan
   Chand & Sons, New Delhi .
2. R. K. Gupta, Operations Research,12th edition, Krishna Prakashan Media Pvt Ltd.,
   Meerut
3. J.K Sharma, Operations Research, Theory and applications (2003), Macmillan
   Publishers,
4. Man Mohan, Kanti Swarup, P. K. Gupta, Introduction to Management Science
   Operations Research, Sultan Chand & Sons, New Delhi.
5. Gupta Prem Kumar, D.S Hira , Problems in Operations Research , Sultan Chand & Co,
   New Delhi.

JOURNALS

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E- LEARNING RESOURCES:

1. http://www.mathforum.org
2. http://www.opensource.org
3. http://khanacademy.org
4. http://in.ixl.com
5. http://www.learningwave.com

SEMESTER I

STATISTICAL TOOLS FOR BUSINESS MANAGEMENT – I
(for I M.Com)

TOTAL HOURS: 90 Hours   **COURSE CODE: 7P18/1C/ST1**
CREDITS:5   **L-T-P : 3 3 0**

COURSE OBJECTIVES:

To enable students to

1. Classify the random variable as discrete and apply the relevant distribution in problems.
2. Classify the random variable as continuous and apply the relevant distribution in problems.
3. Calculate the degree of relationship between 2 variables.
4. Employ the technique of decision making in the problems.
5. Investigate the data and apply the relevant method for obtaining the missing data.

COURSE OUTLINE:

UNIT I: Theoretical discrete distributions – Binomial and Poisson(simple problems only) Fitting of Binomial and Poisson distributions. **(15 Hours)**

UNIT II: Theoretical Continuous distributions – Rectangular and Normal distributions. Fitting of Normal Distribution (simple problems only**)** **(15 Hours)**

UNIT III: Partial and multiple correlations. Regression lines of *x* on *y* and *y* on *x*. (problems only) **(15 Hours)**

UNIT IV: Statistical decision theory – Decision Environment – Decision making under Certainty and Uncertainty- Expected Monetary Value, Expected Monetary Loss and Marginal Analysis. Expected Value of Perfect Information. Decision tree analysis. **(25 Hours)**

UNIT V: Interpolation and extrapolation – Newton forward, backward, Lagrange's Method for unequally spaced arguments. **(20 Hours)**

RECOMMENDED TEXTBOOKS:

1. S.P. Gupta ,Statistical Methods (2012), Sultan Chand & Sons , New Delhi.
2. D.C. Sancheti & V.K. Kapoor ,Statistics (Theory ,Methods & Application), 7th revised edition (1991), Sultan Chand & Sons , New Delhi.

REFERENCE BOOKS:

1. S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics,3rd edition(2014), Sultan Chand & Sons Publications,New Delhi.
2. P.R. Vittal, Mathematical Statistics (Reprint 2015), Margham Publications,
3. S. C Gupta and V. K Kapoor Fundamentals of Mathematical Statistics (2014), Sultan Chand and Sons , New Delhi.
4. B L Agarwal ,Basic Statistics 6th edition (2013),New Age International Private Limited.
5. Murray R Spiegel and Larry J Stephens, Schaum's Outlines Statistics (2017), Mc Graw Hill Education, New York.

JOURNALS:

1. The Mathematics Intelligencer.
2. Mathematics News Letter
3. Journal of Mathematics and Statistics, Science Publications.
4. International Journal of Mathematics and Statistics^{TM}

E-LEARNING RESOURCES:

1. www.oxfordmathcenter.com/drupal7/node/297
2. https://www.analyticsvidhya.com/blog/2017/09/6-probability-distributions-datascience/

3. http://www.real-statistics.com/correlation/multiple-correlation/
4. www.siue.edu/~evailat/decision.htm
5. https://www.geeksforgeeks.org/newton-forward-backward-interpolation/

SEMESTER II

STATISTICAL TOOLS FOR BUSINESS MANAGEMENT – II
(for I M.Com)

TOTAL HOURS: 75 HOURS   **COURSE CODE: 7P18/2C/ST2**
CREDITS:5   **L-T-P : 4-1-0**

COURSE OBJECTIVES:

To enable students to

1. Learn the concept of sampling applied in the problems.
2. Apply the concept of tests of significance in large samples.
3. Apply the concept of tests of significance in small samples
4. Explore on the various methods for finding the association between attributes.
5. Draw valid inferences about the data by carefully analyzing its variance.

COURSE OUTLINE:

UNIT I: Sampling Distribution –Standard errors , errors in sampling , Level of significance, One tailed and Two- tailed test   **(15 Hours)**

UNIT II: Large sample Tests – difference between two means, standard deviations and proportions, Confidence limits**.**   **(15 Hours)**

UNIT III: Small sample tests – *t* tests, means, difference between two means, paired *t* tests for difference of means. F test.   **(15 Hours)**

UNIT IV: Chi square tests – Test of goodness of fit. Test of independence of attributes. Association of two attributes – Comparison method, proportion method, Yule's Co efficient of association. **(15 Hours)**

UNIT V: Analysis of variance – One way and two way classification. Latin Square Design.

(15 Hours)

RECOMMENDED TEXTBOOKS:

1. S.P. Gupta , Statistical Methods (2012), Sultan Chand & Sons, New Delhi.
2. D.C. Sancheti & V.K. Kapoor , Statistics (Theory , Methods & Application), 11th edition (1993),Sultan Chand & Sons , New Delhi.

REFERENCE BOOKS:

1. S.C. Gupta and V.K. Kapoor, Elements of Mathematical Statistics,3rd edition(2014), Sultan Chand & Sons Publications,New Delhi.
2. P.R. Vittal, Mathematical Statistics (Reprint 2015), Margham Publications,
3. S. C Gupta and V. K Kapoor Fundamentals of Mathematical Statistics (2014), Sultan Chand and Sons , New Delhi.
4. B L Agarwal ,Basic Statistics 6th edition (2013),New Age International Private Limited.
5. Murray R Spiegel and Larry J Stephens, Schaum's Outlines Statistics (2017), Mc Graw Hill Education, New York.

JOURNALS:

1. The Mathematics Intelligencer.
2. Mathematics News Letter
3. Journal of Mathematics and Statistics, Science Publications.
4. International Journal of Mathematics and Statistics^{TM}

E-LEARNING RESOURCES:

1. **https://www.statisticssolutions.com/sample-size-calculation-and-sample-size-justification/sampling/**
2. **http://onlinestatbook.com/2/sampling_distributions/samplingdist_diff_means.html**
3. **https://www.coursera.org/lecture/six-sigma-define-measure-advanced/t-distribution-f-distribution-MdOjL**
4. **https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/8-chi-squared-tests**
5. **https://www.analyticsvidhya.com/blog/2018/01/anova-analysis-of-variance**

SEMESTER - I

STATISTICAL METHODS FOR ECONOMISTS
(for I M.A. Business Economics)

TOTAL HOURS: 90 Hours   **COURSE CODE: 8P18/1C/SFE//**

                                                              3P18/1C/SFE

CREDITS: 4   **L-T-P: 3 3 0**

COURSE OBJECTIVES:

1. Provide a strong foundation on statistical concepts
2. Develop skills in handling complex problems in Data analysis and Research
3. Equip the students to calculate vital Statistical indicators.

COURSE OUTLINE:

UNIT I: Interpolation and Extrapolation –Newton's and Lagrange's Methods.

(15 Hours)

UNIT II: Probability - Addition and Multiplication Theorems - Conditional -Probability Discrete and Continuous - Random Variables – Mathematical Expectation –Bayes Theorem- Theoretical Distributions - Binomial, Poisson and Normal**.**   **(20 Hours)**

UNIT III: Simple, Partial and Multiple Correlation- Regression- Regression Lines- Multiple Regression.   **(20 Hours)**

UNIT IV: Univariate and Multivariate Techniques – Factor Analysis.   **(15 Hours)**

UNIT V: Vital Statistics – Sources – Errors in Census and Registration – Measurement of Population rate and Ratio of vital events –Measurement of Mortality – Crude Death Rate (CDR) - Specific Death Rate (SDR)– Infant Mortality Rate (IMR) and Standardized Death Rate (SDR)-Maternal Mortality Rate(MMR) Morbidity Rate.   **(20Hours)**

RECOMMENDED TEXT BOOKS:

1. S.P Gupta, "Statistical Methods "(2017), Sultan Chand & Sons, New Delhi.
2. Anderson ,Sweeney and Williams, "Statistics for Business and Economics"(2012),Cengage.

REFERENCE BOOKS:

1. Anderson, David Ray, "Statistics for Business and Economics" (2012), South-Western Publication s
2. Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi S.Ranganatham, Dr.M.V.S.S.N.Prasad , Probability and Statistics (2015), S.Chand & Co., New Delhi.
3. R.S.N. Pillai and V.Bagavathi, Statistics (2010), Sultan & Chand Sons, New Delhi.
4. Sancheti .D.C and V.K. Kapoor," Statistical Theory-Method and Application (2010) ", Sultan chand & Sons, New Delhi.
5. SC. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics(2014).
6. Dr.S.Sachdeva- Statistics (2014)   -Lakshmi Narain Agarwal .

JOURNALS:
1. Journal of Applied Statistics
2. Journal of Statistical Software
3. The STATA Journal
4. Journal of Statistics Education

E-LEARNING RESOURCES

1. **https://guides.library.uoit.ca**
2. **https://www.statista.com.**
3. **https://techjury.net**
4. **https://scholar.harvard.edu>dromney**
5. **https://www.elearningworld.org**

SEMESTER – II

STATISTICS WITH COMPUTER APPLICATIONS
(for I M.A. Business Economics)

TOTAL HOURS: 75 Hours   **COURSE CODE: 8P18/2C/SCA//**
                                                                                    3P18/2C/SCA

CREDITS: 4   **L-T-P : 2 2 1**

COURSE OBJECTIVES:

1. Make students familiar with various statistical tools and their Application.
2. Train the students in the application of Computer software in Statistical Data Analysis
3. Deal with economic issues using statistical data.

COURSE OUTLINE:

UNIT I: Sampling Theory- Types of Sampling **-**Sampling Distributions and Standard
          Error of–Means - Standard Deviation and Proportions - Testing of
          Hypothesis **-** Level of Significance - Type I and Type II Error - Large

Sample test for Two Means - Two Standard Deviations and Two Proportions.

(15 Hours)

UNIT II: Estimator and Estimate – Point and Interval Estimates – Reliability of an Estimate – Sampling Variance and Mean Square Error – Properties of a goodestimator. **(15 Hours)**

UNIT III: Small Sample Test – t-test- Paired t- test - Chi-square Test- Test of Goodness of Fit – Test of Homogeneity - Test of Independence of TwoAttributes. **(15 hours)**

UNIT IV:F test – Analysis of Variance- One Way and Two-Way Classifications **(15 Hours)**

UNIT V: Introduction – Statistical Data Files- Statistical Workbook – Installation Data Spreadsheet Toolbar - Scroll Sheet Applications- Diagrams and Graphs - Elementary concepts in Statistics – Application in Computer Correlation, Multiple Correlation - Regression – Multiple Regression ANOVA **(Practical Examination only for this unit. No question for End Semester Examination)** **(15 Hours)**

RECOMMENDED TEXT BOOKS:

    1. S.P Gupta, "Statistical Methods (2017)", Sultan Chand & Sons, New Delhi.
    2. Anderson,Sweeney and Williams, "Statistics for Business and Economics(2012)",Cengage.

REFERENCE BOOKS:

1. Anderson, David Ray, "Statistics for Business and Economics (2001)", South-Western Publicaions.
2. Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi S.Ranganatham, Dr.M.V.S.S.N.Prasad , Probability and Statistics (2015), S.Chand & Co , New Delhi.
3. R.S.N. Pillai and V.Bagavathi, Statistics (2010), Sultan & Chand Sons, New Delhi.
4. Sancheti .D.C and V.K. Kapoor," Statistical Theory-Method and Application (2010)", Sultan chand & Sons, New Delhi.
5. S .C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics (2014).
6. Dr.S.Sachdeva- Statistics(2014) -Lakshmi Narain Agarwal.

JOURNALS:

1. Journal of Applied Statistics
2. Journal of Statistical Software
3. The STATA Journal
4. Journal of Statistics Education

E-LEARNING RESOURCES:

    1. **https://www.statista.com.**

2. https://techjury.net
3. elearning.ec.unipi.gr>elearning
4. http://www.coursera.org/learn/economics
5. http://www.springboard.com

UG - Non Major Elective -Course Profile

Semester I & II

(Offered to Other Departments)

NON-MAJOR ELECTIVE

STATISTICS USING EXCEL

TOTAL HOURS: 30 Hours	**COURSE CODE: MA18 / 1N / SUE**
	MA18 / 2N / SUE
CREDITS: 2	**L-T-P: 0 0 2**

COURSE OBJECTIVES:

To enable students to

1. Understand the basic concepts of collection, classification and tabulation of data.

2. Find the measures of averages and dispersion for given data.
3. Represent the various measures using MS Excel.

COURSE OUTLINE:

UNIT I: DIAGRAMMATIC REPRESENTATION OF DATA
　　One – dimensional diagrams: – Simple bar diagram, multiple bar diagram, sub-divided bar diagram. Two – dimensional diagram: – Pie diagram. 　　　　　　**(10 Hours)**

UNIT II: MEASURES OF AVERAGES
　　Simple arithmetic mean, Median, Mode (raw data & Discrete Series only). 　**(10 Hours)**

UNIT III: MEASURES OF DISPERSION
　　Range, Standard deviation, Variance (raw data & Discrete Series only). 　**(10 Hours)**

(All the units to be covered through practical sessions)

BOOKS RECOMMENDED:

1. R.S.N. Pillai & V. Bagavathi, Statistics, S.Chand & Company Ltd, New Delhi.

REFERENCE BOOKS:

1. P.R. Vittal, Mathematical Statistics, Margham Publications
2. S.P. Gupta Statistical methods, Sultan Chand & Sons publications.
3. Narasimhan, Veeraraghavan, Ramachandran, Ramana, K. C. S Desikan and Co., Business Mathematics and Business Statistics.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography

E-LEARNING RESOURCES:

1. **http://www.mathforum.org**
2. **http://www.opensource.org**
3. **http://www.khanacademy.org**
4. **http://in.ixl.com**
5. **http://www.learningwave.com**

Self Study Papers

Semester V & VI

GRAPH THEORY

CREDITS: 2

(Prerequisite- Knowledge of :- Graphs and simple graphs - Graph isomorphism - Incidence and adjacency matrices - sub graphs - types of graphs - vertex degrees - Path and connection - Cycles - Trees - Cut vertices and cut edges – connectivity)

COURSE OBJECTIVES:

The student will be able

➢ To provide structural characterization of graphs with matching, perfect matching and graph coloring.

> ➤ To give structural understanding of planar graphs.

UNIT I: INTRODUCTION

Graphs and simple graphs – Graph isomorphism – Incidence and adjacency matrices – Sub graphs – Paths and connection – cycles – Trees – Cut edges and bonds – Cut vertices.

UNIT II: CONNECTIVITIY AND TRAVERSIBILITY

Connectivity – Whitney's theorems – Blocks – Applications of connectivity – Euler's tour – Hamilton Cycles – The Chinese Postman Problem – The traveling Salesman Problem (only a brief introduction on these problems.)

UNIT III: MATCHING

Matching – Matching and covering of bipartite graph - Perfect matching's - Covering - Independent sets.

UNIT IV: COLORING

Coloring - Vertex chromatic number - k-critical graphs – Brook's theorem – Chromatic polynomials - Girth and Chromatic number.

UNIT V: PLANAR GRAPHS

Planar graphs - Euler's formula - Kurtowski's theorem - Five colour theorem.

BOOKS RECOMMENDED:

1. Bondy J. A and Murthy U. S. R., "Graph theory with Applications", Elsevier North – Holland, New York, 1976.
2. Dougalas B. West, Ïntroduction to Graph Theory", Pearson, Second Edition, New York, 2015.

REFERENCE BOOKS:

1. Balakrishnan R. and Ranganathan K., Ä Text Book of Graph Theory, Springer – Verlag, New York, 2012.
2. Chartrand G. and Lesneik Foster L., "Graphs and Digraphs", CRC Press, 4th edition, Boca Raton, 2006.
3. Harary F., "Graph Theory", Narosa Publishing House, New Delhi, 2001.

JOURNALS:

1. Mathematics Newsletter Published by Ramanujan Mathematical Society, Chennai.
2. Discrete Mathematical Sciences & Cryptography
3. Journal of Discrete Mathematics – Elsevier
4. Journal of Combinatorial Theory Series A & B - Elsevier

E-LEARNING RESOURCES:

1. http://www.mathforum.org
2. http://www.opensource.org
3. http://khanacademy.org
4. http://in.ixl.com
5. http://www.learningwave.com

FUNDAMENTALS OF FUZZY SET THEORY

CREDITS: 2

COURSE OBJECTIVES:

The student will be able to
- Understand the fundamentals of fuzzy sets.
- Explore the application of uncertainty through fuzzy mathematics.
- Apply fuzzy concept to physical and social science problems.
- To get knowledge about fuzzy numbers.
- To know how to implement arithmetic operations on intervals.

COURSE OUTLINE:

UNIT I: Introduction
Crisp sets, Basic types of fuzzy sets.
Chapter 1: Sections 1.1, 1.2, 1.3

UNIT II: Fuzzy Sets
Basic Concepts of fuzzy sets.
Chapter 1: Sections 1.4

UNIT III: Fuzzy sets verses Crisp sets
Additional Properties of α- cuts, Representations of fuzzy sets.
Chapter 2: Sections 2.1, 2.2

UNIT IV: Fuzzy Arithmetic
Fuzzy Numbers, Linguistic Variables
Chapter 4 : Sections 4.1 , 4.2

UNIT V: Fuzzy Arithmetic (Continuation)
Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers
Chapter 4 : Sections 4.3 , 4.4

BOOKS RECOMMENDED:

1. George J.Klir and Bo Yuan, Fuzzy sets and Fuzzy logic theory and Applications, Prentice Hall of India, New Delhi 2001.

REFERENCE BOOKS:

1. Introduction to Fuzzy Arithmetic by A. Kauffman, Van Nostrand Reinhold, 1991.
2. Fuzzy Set Theory – and its Applications, 4th edition, by L.A. Zadeh.

3. Introduction to Fuzzy Logic by Rajjan Shinghal, Prentice Hall of India.
4. Introduction to Fuzzy Sets and Fuzzy Logic by M. Ganesh, Prentice Hall of India, 2006.
5. Fuzzy Logic with Engineering Applications by Timothy J. Ross, 3rd Edition, 2011.
6. Fuzzy Set Theory, Fuzzy Logic and their Applications by Dr. A.K. Bhargava, S. Chand.

JOURNALS:

1. International Journal of Fuzzy Logic Systems (IJFLS) – Wireilla.
2. Journal of Intelligent & Fuzzy Systems - IOS Press.
3. The Mathematics Intelligencer.
4. Mathematics News letter.

WEBSITES AND e-LEARNING SOURCES:

1. http://mathforum.org,
2. https://cours.etsmtl.ca/sys843/REFS/Books/ZimmermannFuzzySetTheory2001.pdf
3. http://OCW.mit.edu/ocwweb/Mathematics
4. http://www.iaeng.org/IJCS/issues_v39/issue_1/IJCS_39_1_07.pdf
5. https://sci2s.ugr.es/fss