DEPARTMENT OF MATHEMATICS

Program of study for B.Sc. Degree in Mathematics (Aided)

(w.e.f. 2017-18)

Sem.	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	I	XXX xxxx	TAM/FRE/HIN	3	2	30
1	II	ENG xxxx	Conversational Skills	3	2	30
1	III M	MAT 1511	Classical Algebra	5	5	75
1	III M	MAT 1411	Analytical Geometry -3D	4	4	60
1	III M	MAT 1413	Differential Calculus	4	4	60
1	III S	MAT 1321	Programming in C	3	3	45
1	IIIS	MAT 1101	Programming in C - Lab	2	1	15
1	IV LS	XXX xxxx	Life Skill - I	3	2	30
1	IV NME	XXX xxxx	Non-major Elective - I	3	2	30
			Total	**30**	**25**	**375**
2	I	XXX xxxx	TAM/FRE/HIN	3	2	30
2	II	ENG xxxx	Reading &Writing Skills	3	2	30
2	III M	MAT 1512	Algebra- I	5	5	75
2	III M	MAT 1412	Analysis -I	4	4	60
2	III M	MAT 1414	Integral Calculus	4	4	60
2	III S	MAT 1322	Object Oriented Programming in C++	3	3	45
2	IIIS	MAT1102	Object Oriented Programming In C++ -Lab	2	1	15
2	IV LS	XXX xxxx	Life Skill - II	3	2	30
2	IV NME	XXX xxxx	Non-major Elective - II	3	2	30
2	V	XXX xxxx	Ext. Activity NCA/NCN/NSS/PED/SLP		1	15
			Total	**30**	**26**	**390**
3	I	XXX xxxx	TAM/FRE/HIN	3	2	30
3	II	ENG xxxx	Study Skills	3	2	30
3	III M	MAT 2511	Algebra -II	5	5	75
3	III M	MAT 2513	Analysis -II	5	5	75
3	III M	MAT 2515	Differential Equations	5	5	75
3	III M	MAT 2411	Statistics- I	4	4	60
3	III S	PHY xxxx	Physics for Mathematics- I	5	4	60
			Total	**30**	**27**	**405**

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
4	I	XXX xxxx	TAM/FRE/HIN	3	2	30
4	II	ENG xxxx	Career Skills	3	2	30
4	III M	MAT2512	Algebra- III	5	5	75
4	III M	MAT 2514	Analysis- III	5	5	75
4	III M	MAT 2516	Vector Calculus & Trigonometry	5	5	75
4	III M	MAT 2412	Statistics- II	4	4	60
4	III S	PHY xxxx	Physics for Mathematics- II	5	4	60
4	V	XXX xxxx	Ext. Activity NCA/NCN/NSS/PED/SLP		1	15
			Total	**30**	**28**	**420**
5	III M	MAT 3611	Mechanics	6	6	90
5	III M	MAT 3613	Graph Theory	6	6	90
5	III M	MAT 3615	Operations Research- I	6	6	90
5	III M	MAT 3511	Combinatorics	5	5	75
5	IV LS	XXX xxxx	Life Skill- III	3	2	30
5	IV	MAT 3200	Environmental Studies	4	2	30
			Total	**30**	**27**	**405**
6	III M	MAT 3612	Number Theory	6	6	90
6	III M	MAT 3614	Complex Analysis	6	6	90
6	III M	MAT 3616	Operations Research-II	6	6	90
6	III M	MAT 3512	Fuzzy Mathematics	5	5	75
6	IV LS	XXX xxxx	Life Skill - IV	3	2	30
6	IV	VAL xxxx	Value Education	4	2	30
			Total	**30**	**27**	**405**

Courses offered to Non-major students by the Department of Mathematics (UG)

Supportive:

Sem.	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	III S	MAT 1431	Maths for Physics- I	5	4	60
1	III S	MAT1433	Maths for Economics (ECE & ECO)	5	4	60
2	III S	MAT 1432	Maths for Physics- II	5	4	60
2	III S	MAT 1334	Fundamentals of Computer Applications(ECE &ECO)	3	2	45
2	III S	MAT 1104	Fundamentals of Computer Applications-Lab	2	1	15
3	III S	MAT 2431	Maths for Chemistry- I	5	4	60
3	III S	MAT 2433	Business Statistics (COM)	5	4	60
4	III S	MAT 2432	Maths for Chemistry- II	5	4	60
4	III S	MAT 2434	Business Mathematics (COM)	5	4	60

Non-Major Elective

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAT1221	Arithmetic & Mathematical Logic	3	2	30
2	IV	MAT 1222	Recreational Mathematics	3	2	30

Life Skill Courses

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAT 1231	Mathematics for Life	3	2	30
2	IV	MAT 1232	Mathematical Reasoning	3	2	30
5	IV	MAT 3231	Mathematics for Competitive Exam	3	2	30
6	IV	MAT 3232	Developing Quantitative Aptitude	3	2	30

DEPARTMENT OF MATHEMATICS

Program for B.Sc. Degree in Mathematics (SF)

(w.e.f. 2017-18)

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
1	I	XXX xxxx	TAM/FRE/HIN	3	2	30
1	II	ENS 1201	Conversational Skills	3	2	30
1	III M	MAS 1511	Classical Algebra	5	5	75
1	III M	MAS 1411	Analytical Geometry -3D	4	4	60
1	III M	MAS 1413	Differential Calculus	4	4	60
1	III S	PHS xxxx	Physics for Mathematics - I	5	4	60
1	IV LS	XXX xxxx	Life Skill - I	3	2	30
1	IV NME	XXX xxxx	Non-major Elective - I	3	2	30
			Total	**30**	**25**	**375**
2	I	XXX xxxx	TAM/FRE/HIN	3	2	30
2	II	ENS 1202	Reading &Writing Skills	3	2	30
2	III M	MAS 1512	Algebra- I	5	5	75
2	III M	MAS1412	Analysis -I	4	4	60
2	III M	MAS 1414	Integral Calculus	4	4	60
2	III S	PHS xxxx	Physics for Mathematics - II	5	4	60
2	IV LS	XXX xxxx	Life Skill - II	3	2	30
2	IV NME	XXX xxxx	Non-major Elective - II	3	2	30
2	V	XXX xxxx	Ext. Activity NSS/PED/SLP		1	15
Total				**30**	**26**	**390**

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
3	I	XXX xxxx	TAM/FRE/HIN	3	2	30
3	II	ENS 2201	Studies Skills	3	2	30
3	III M	MAS 2511	Algebra -II	5	5	75
3	III M	MAS 2513	Analysis -II	5	5	75
3	III M	MAS 2515	Differential Equations	5	5	75
3	III M	MAS 2411	Statistics- I	4	4	60
3	III S	COS xxxx	Programming in C	5	4	60
			Total	**30**	**27**	**405**
4	I	XXX xxxx	TAM/FRE/HIN	3	2	30
4	II	ENS 2202	Career Skills	3	2	30
4	III M	MAS 2512	Algebra- III	5	5	75
4	III M	MAS 2514	Analysis- III	5	5	75
4	III M	MAS 2516	Vector Calculus & Trigonometry	5	5	75
4	III M	MAS 2412	Statistics- II	4	4	60
4	III S	COS xxxx	Programming in C++	5	4	60
4	V	XXX xxxx	Ext. Activity NSS/PED/SLP		1	15
			Total	**30**	**28**	**420**

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
5	III M	MAS 3611	Mechanics	6	6	90
5	III M	MAS 3613	Graph Theory	6	6	90
5	III M	MAS 3615	Operations Research- I	6	6	90
5	III M	MAS 3511	Combinatorics	5	5	75
5	IV LS	XXX xxxx	Life Skill- III	3	2	30
5	IV	MAS 3200	Environmental Studies	4	2	30
			Total	**30**	**27**	**405**
6	III M	MAS 3612	Number Theory	6	6	90
6	III M	MAS 3614	Complex Analysis	6	6	90
6	III M	MAS 3616	Operations Research- II	6	6	90
6	III M	MAS 3512	Fuzzy Mathematics	5	5	75
6	IV LS	XXX xxxx	Life Skill - IV	3	2	30
6	IV	VAL xxxx	Value Education	4	2	30
			Total	**30**	**27**	**405**

Courses offered to Non-major students by the Department of Mathematics (UG)

Supportive:

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
1	III	MAS 1431	Maths for Physics- I	5	4	60
1	III	MAS 1433	Discrete Mathematics (BCA)	5	4	60
1	III	MAS 1435	Maths for Chemistry - I	5	4	60
1	III	MAS1439	Business Statistics (CPA)	5	4	60
2	III	MAS 1432	Maths for Physics- II	5	4	60
2	III	MAS 1434	Discrete Mathematics (COS)	5	4	60
2	III	MAS 1436	Maths for Chemistry – II	5	4	60
2	III	MAS 1438	Statistics (BIT)	5	4	60
2	III	MAS 1440	Business Statistics(BBA)	5	4	60
2	III	MAS 1446	Business Mathematics (CPA)	5	4	60
3	III	MAS 2431	Operations Research (BIT)	5	4	60
3	III	MAS 2433	Business Statistics (CME)	5	4	60
3	III	MAS 2437	Business Statistics (CIT)	5	4	60
3	III	BBA 2545	Quantitative Techniques (BBA)	5	4	60
3	III	MAS 2475	Business Statistics (CMC)	5	4	60
3	III	MAS 2477	Numerical and Statistics Methods (COS)	5	4	60
4	III	MAS 2434	Business Mathematics (CME)	5	4	60
4	III	MAS 2438	Business Mathematics (CIT)	5	4	60
4	III	MAS 2440	Operations Research (BCA)	5	4	60
4	III	MAS 2454	Biostatistics (BCH)	5	4	60
4	III	MAS 2466	Business Mathematics (CMC)	5	4	60
4	III	MAS 2472	Biostatistics (MIC)	5	4	60

Non-Major Elective:

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
1	IV	MAS1221	Arithmetic & Mathematical Logic	3	2	30
2	IV	MAS 1222	Recreational Mathematics	3	2	30

Life Skill Courses:

Sem.	Part	Course Code	Course Title	Hrs/Wk	Cr.	Marks
1	IV	MAS 1231	Mathematics for Life	3	2	30
2	IV	MAS 1232	Mathematical Reasoning	3	2	30
5	IV	MAS 3231	Mathematics for Competitive Examinations	3	2	30
6	IV	MAS 3232	Developing Quantitative Aptitude	3	2	30

Programme Specific Outcomes (PSO) For Undergraduate Mathematics Programme.

On successful completion of the bachelors' programme in *Mathematics*,the graduate will be able to

1. register, remember and recall ideas and add knowledge in the field of mathematics
2. demonstrate basic manipulative skills in geometry, calculus ,algebra, analysis, statistics, and operation research,
3. communicate mathematical ideas including abstract mathematical concepts and discrete mathematical structures   both in oral and verbal form.
4. use mathematical tools and techniques toinvestigate problems in varied fields related to science, technology, business and industry. Demonstrate these solutions using symbolic, numeric and graphical methods thus become employable.
5. assimilate complex and intricate mathematical concepts and use logical deductions for construction of irrefutable proof.Demonstrate the proficiency in understanding and writing proofs with logical precision and mathematical vigor
6. understand the historic perspective of mathematics and its role in the contemporary scientific and technological world and place the discipline properly in the context of other human intellectual growth and achievement.
7. write coding in the latest language and demonstratein the lab.
8. compete in the national/international level competition for further studies in reputed institutions.
9. equip them to suit any environment in a global context of multilingual, multicultural, multiethnic and multiracial communities without compromising the core values and ethos which in turn prepare him/her for a global citizen.
10. develop civic responsibilities, personality traits and human values   through interaction with society by adopting villages.

Mapping of Courses Outcomes (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10
MAT /MAS 1511	X	X	X	X	X	X				
MAT /MAS 1411	X	X	X	X	X	X				
MAT /MAS 1413	X	X	X	X	X	X				
MAT 1321	X		X	X			X	X	X	
MAT 1101	X		X	X			X	X	X	
MAT /MAS 1512	X	X	X	X	X			X		
MAT /MAS 1412	X	X	X	X	X			X		
MAT /MAS 1414	X	X	X	X	X	X				
MAT 1322	X		X	X			X	X	X	
MAT 1102	X		X	X			X	X	X	
MAT /MAS 2511	X	X	X	X	X			X		
MAT /MAS 2513	X	X	X	X	X			X		
MAT /MAS 2515	X	X	X	X	X			X		
MAT /MAS 2411	X	X	X	X				X		X
MAT /MAS 2512	X	X	X	X	X			X		
MAT /MAS 2514	X	X	X	X	X			X		
MAT /MAS 2516	X	X	X	X	X	X		X		
MAT /MAS 2412	X	X	X	X		X		X		X
MAT /MAS 3611	X	X	X	X	X	X		X		
MAT /MAS 3613	X		X	X	X	X		X		
MAT /MAS 3615	X	X	X	X		X	X	X		X
MAT /MAS 3511	X		X	X	X	X		X		
MAT /MAS 3200	X		X	X		X			X	X
MAT /MAS 3612	X		X	X	X	X		X		
MAT /MAS 3614	X	X	X	X	X	X		X		
MAT /MAS 3616	X	X	X	X		X	X	X		X
MAT /MAS 3512	X		X	X	X	X		X		
MAT /MAS 1431	X	X	X	X	X	X		X		
MAT 1433	X	X	X	X		X		X		
MAT /MAS 1432	X	X	X	X	X	X		X		
MAT 1334	X	X	X	X		X	X	X		
MAT 1104	X		X	X			X	X	X	
MAT 2431	X	X	X	X	X	X		X		
MAT /MAS 2433	X	X	X	X		X		X		
MAT 2432	X	X	X	X	X	X		X		
MAT /MAS 2434	X	X	X	X		X		X		
MAS 1433	X		X	X	X	X		X		
MAS 1435	X	X	X	X	X	X		X		
MAS1439	X	X	X	X	X	X		X		

MAS 1434	X		X	X	X	X		X		
MAS 1436	X	X	X	X	X	X		X		
MAS 1438	X	X	X	X	X	X		X		
MAS 1440	X	X	X	X	X			X		
MAS 1446	X	X	X	X	X			X		
MAS 2431	X	X	X	X	X	X		X		
MAS 2437	X	X	X	X	X	X		X		
BBA 2545	X	X	X	X	X	X		X		
MAS 2475	X	X	X	X	X			X		
MAS 2477	X	X	X	X			X	X		
MAS 2438	X	X	X	X	X			X		
MAS 2440	X	X	X	X	X			X		
MAS 2454	X	X	X	X	X	X			X	
MAS 2466	X	X	X	X	X			X		
MAS 2472	X	X	X	X	X	X			X	
MAT /MAS 1221	X		X	X	X			X	X	
MAT /MAS 1222	X		X	X	X	X		X		
MAT /MAS 1231	X	X	X			X		X		X
MAT /MAS 1232	X		X	X	X			X	X	
MAT /MAS 3231	X		X	X	X			X	X	
MAT /MAS 3232	X		X	X	X			X	X	

Programme Outcomes (Pos) for Undergraduates

Undergraduate programmes are expected to have developed in undergraduates the following graduate attributes:

1. *Cognitive Ability*: Capacity to register, remember and recall ideas and add knowledge in the relevant discipline.
2. *Reflective Skills*: Ability to apply knowledge and solve problems in similar but unknown disciplinary contexts.
3. *Communicative Competence*: Ability to communicate in one's mother tongue and in English discipline-specific complex ideas and life experiences.
4. *Aptitude for Higher Studies*: To be proactive in demonstrating general aptitude to evaluate the circumstances and come up with an interest to progress further in career by opting for post studies or through entrepreneurial initiatives at offing in the multidisciplinary and trans-disciplinary contexts.
5. *Employability Capacity*: Ability to serve the nation as school teachers, responsible staff and officers in various private and public sectors to find suitable meaning for the education they have pursued here.
6. *Action Research Aptitude*: Skills to undertake action research as independent projects on the themes and issues concerning life and work moving ahead with techno-savvy and eco-friendly approaches.
7. *Quest for Lifelong Learning*: Skills to learn lifelong independent of academia transcending the space and time barriers.
8. *Study Abroad*: Ability to pursue higher studies in a global context of multilingual, multicultural, multiethnic and multiracial communities without compromising the values and ethos cherished and nurtured in love with the motherland.

9. *Citizenry Attributes*: Be responsible citizens with democratic bent of mind, probity in public life, moral uprightness, and commitment for social uplift of the marginalised, the poor, the destitute, and the needy.

10. *Civic Responsibility*: Capacity to respect human values, to exhibit religious tolerance, and to practise politics of difference and dissent.

Mapping of PSOs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	X	X	X	X	X		X			
PSO2	X	X	X	X	X		X		X	
PSO3	X	X	X	X	X		X			
PSO4	X	X	X	X	X		X	X		
PSO5	X	X	X	X	X		X	X		
PSO6	X	X	X	X	X	X	X	X		
PSO7	X	X	X	X	X	X		X		
PSO8	X	X	X	X	X		X	X		
PSO9	X	X	X	X	X		X	X	X	X
PSO10	X	X	X	X	X		X		X	X

MAT / MAS 1511   **CLASSICAL ALGEBRA**   **5Hrs / 5Cr**

This is a foundational course for any student aspiring to complete B.Sc., degree in Mathematics. The students are introduced to the different methods of solving polynomials with real coefficients.

At the end of the course, students will be able to

i.   specify the basic relations between roots and coefficients and solve the transformed equation.
ii. predict approximate solutions to equations.
iii. recognize the inequalities involving arithmetic mean, geometric mean and harmonic mean and the other standard inequalities and use it appropriately .
iv. recognize and distinguish binomial, exponential and logarithmic series and use it appropriately.
v.   use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, Eigen values and Eigenvectors.

Unit 1: Theory of Equations: – Relation between roots and coefficients – Symmetric functions of roots – Formation of equation – Transformation of equation.

Unit 2: Reciprocal equation – Descartes' rule of signs – Diminishing and Increasing the roots – Newton's method of divisors – Horner's method.

Unit 3: Inequalities: – A.M., G.M. , H.M. and applications – Cauchy Schwartz inequality – Weierstrass inequality – Applications to maxima and minima.

Unit 4: Binomial, Exponential and Logarithmic series – Approximations.

Unit 5: Types of Matrices – Elementary transformations – Inverse of a matrix and Rank of matrix using elementary transformations – Solution of simultaneous linear equations – Eigen values and Eigen vectors - Cayley Hamilton theorem.

Text book:

T.K. Manickavachagam Pillay, T. Natarajan and K.S. Ganapathy,Algebra Vol I and II, S.Viswanathan Pvt. Ltd., 2013.

> **Unit 1:** Manickamvachagompillayvol-I pg (288-307) & (318-320)

> **Unit 2:** Manickamvachagompillayvol-I pg (321-334) & (351-354)&(370-382)

Unit 3: Manickamvachagompillayvol-II pg (181-199), (203-208) & (212-217)

Unit 4: Manickamvachagompillayvol-I pg (143-152), (168-177) & (194-207), (214-221), (225-227)& (102-114).

Unit 5: Manickamvachagompillayvol-II pg   (59-88, 91-110&117-122 which excludes Diagonalisation)

Reference Books:

1. S. Arumugam, A. Thangapandian Isaac, Theory of Equations, New Gamma Publishing House, 1996.
2. M.L. Khanna, Matrices, S.Chand and Co., 1998.
3. S. Arumugam, A. Thangapandian Isaac, Modern Algebra,Scitech publications pvt ltd, 1996

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		
K4: Analysing				4	4
K5: Evaluating					
K6: Creating					

Mean= 3.2

MAT / MAS 1411   **ANALYTICAL GEOMETRY-3D**   **4Hrs / 4Cr**

This is a foundational course for any student aspiring to complete B.Sc., degree in Mathematics. Analytical geometry is a conventional mathematics course which deals with geometrical objects in their analytical form. The first two units are entirely devoted for understanding objects such as planes and lines in three dimensions. The co planarity of two straight lines or they being skew lines is dealt. The analytical form of a sphere, cone and cylinder are introduced.

At the end of the course, students will be able to

  i.   explain the fundamental ideas about coordinate geometry.
 ii.   identify lines and planes from the given equations, also find the angle between them.
iii.   describe the various forms of equation of a plane and straight line.
 iv.   measure the distance between points, lines and planes.
  v.   analyze the concept of sphere, cone and cylinder.

Unit 1: Rectangular Cartesian co-ordinates – Direction ratios and Direction cosines.

Unit 2: The plane- Angle between the planes- Equation of a plane through the line of intersection of two given planes- Length of the perpendicular- Equation of the planes bisecting the angle between the planes.

Unit 3: Straight lines-Symmetrical form of equation of the lines- Equation of straight line passing through two given points.

Unit 4: Plane and the straight line- Co planarity of straight lines- Shortest distance between two given lines-Intersection of three planes- Volume of a tetrahedron.

Unit 5: Standard equation of sphere-Results based on the properties of a sphere -Tangent plane to a sphere- Equation of a circle- Introduction to cone and cylinder.

Text Book:

Manicavachagom pillay. T.K, and Natarajan .T, Analytical Geometry Part II 3D, S.Viswanathan Pvt. Ltd., 2006.
Unit 1: Chapter 1
Unit 2: Chapter 2
Unit 3: Chapter 3 (Sec 1-4)
Unit 4: Chapter 3 (Sec 5-11 except section 9)
Unit 5: Chapter 4, Chapter 5 (Cone and cylinder –Definition and related problems in Right circular   cone and Right circular cylinder)

Reference Books:

1. Durai Pandian. P, Analytical Geometry, Asia Publishing House, 1968.
2. Arumugam. S, and Thangapandian Isaac.A , Analytical Geometry, New Gamma Publishing house, 1996.
3. Qazi zameeruddin, khanna V K, Solid Geometry, Vikas publishing house pvt. Ltd 1997.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2		2		
K3: Applying					3
K4: Analysing		4		4	
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 1413   DIFFERENTIAL CALCULUS   4Hrs / 4Cr

This is a foundational course for any student aspiring to complete B.Sc., degree in Mathematics. The calculus is the science of determining the effect of very small change. Different methods of calculating the derivative of a function and the interpretation of derivative at different circumstances are dealt in detail. The functions involving more than one variable and the rate of change with respect to one variable are attributed as partial

derivative. The application of partial derivatives as a tool for engineers, scientists and social scientists are illustrated.

At the end of the course, students will be able to

i. illustrate the limit definition and recall the formulae and rules of differentiation to differentiate the given functions.
ii. make use of partial fraction and Leibnitz formula to find n^{th} derivative of algebraic and trigonometric functions in addition to formation of equations involving derivatives.
iii. apply the concepts of differentiation to discuss the maxima and minima of the functions and find the equations of the tangent and normal.
iv. define and determine envelope, curvatures, involute and evolute of the curve.
v. identify and apply partial differentiation to determine the maxima and minima of functions of two variables and approximate error.

Unit 1: Differentiation – Standard form – Function of function rule – Hyperbolic function – Inverse function – Substitution - Logarithmic function – Transformation – Implicit function – one function with respect to other function.

Unit 2: Successive differentiation, n^{th} derivatives – Leibnitz formula for n^{th} derivative of a product.

Unit 3: Interpretation of derivatives - Tangent and Normals – Maxima and Minima of single variable.

Unit 4: Envelope – Curvature – Center of curvature – Radius of curvature – Evolutes and Involutes.

Unit 5: Partial differentiation – Errors and approximation – Maxima and Minima for functions of two or more variables.

Text Book:
Narayanan. S. and Manickavachagom Pillay. T.K., Calculus Vol I, Viswanathan Pvt Ltd, 2013.
Unit 1: Chapter- II (Sec 3-6)
Unit 2: Chapter- III
Unit 3: Chapter -V (Sec 1) and Chapter-IX
Unit 4: Chapter-X
Unit 5: Chapter-VIII

Reference Books:
1. Arumugam. S and Thangapandian Isaac. A, Calculus Vol I, New Gamma Publishing House, 2013.
2. Shanti Narayan and Dr. Mittal.P.K, Differential Calculus, S.Chand & company Ltd, 2005.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2			2	

K3: Applying		3			
K4: Analysing			4		4
K5: Evaluating					
K6: Creating					

Mean=3

MAT1321   **PROGRAMMING IN C**   **3Hrs / 3Cr**

This is a supportive course for all students aspiring to complete B.Sc., degree in Mathematics. This course introduces the syntax of the programming in C and develops the skills in writing programs.

At the end of the course, students will be able to

i. describe the concept of structure oriented programming and understand various C-tokens.
ii. illustrate with examples the idea of conditional statements and looping statements.
iii. categorize one dimensional, two dimensional and multi dimensional arrays.
iv. differentiate various 'function prototypes' and demonstrate nesting of functions.
v. distinguishes the idea of structures and unions, structure and arrays, structures and functions. Understand the basics of pointers.

Unit 1: Introduction to C- History- Identifiers- Keywords- Variables-Data types - Operators and Expressions - Input and Output statements.

Unit 2: Conditional statements: simple if, if-else, nested if-else, else if ladder, switch and goto statement-Looping statements: while, do-while and for statements -Nesting of loops.

Unit 3: Introduction to Arrays- One dimensional- Two dimensional and Multi dimensional array- Array of Characters - Strings - String functions.

Unit 4: Introduction to Modular Programming: Functions-Call by Value-Call by reference Category of functions-Nesting of functions-Recursion.

Unit 5: Introduction to structures and unions- Array of structures-Array within Structures, Structures within Structures-Structures and Functions- Introduction to pointers.

Text Book:

Balagurusamy. E, Programming in ANSI C, Tata McGraw-Hill, Third Edition, 2013.

Unit 1: sections 1.1-1.10; 2.2-2.14; 3.2-3.16; 4.1-4.5
Unit 2: sections 5.1-5.9; 6.1-6.5
Unit 3: sections 7.1-7.8; 8.1-8.8
Unit 4: sections 9.1-9.18
Unit 5: sections 10.1-10.13; 11.1-11.5

Reference Books:

1. LesHanCock, Morris Kringer, C Primer, McGrawHill, 1997.
2. Y. Kanetkar, Understanding Pointers in C, 4th Edition, BPB publications, New Delhi.
3. D. M. Ritchie, The C programming language, Prentice Hall of India, 1977.
4. C. Gottfried, Programming in C, Schaum outline series, 1996.
5. P.Pandiyaraja, Programming in C, Vijay Nicole Imprint Private Limited, 2005.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding					
K3: Applying		3	3		
K4: Analysing				4	4
K5: Evaluating					
K6: Creating					

Mean= 3

MAT1101   **PROGRAMMING IN C-LAB**   **2Hrs/1Cr**

This course is mainly concentrates on programming concepts of C and its implementation. It makes the students to be familiar with the syntax and structure of C programming language and it enables them to write programs to solve real world problems using C concepts.

At the end of the course, students will be able to

   i.   execute simple programs using input/ output and conditional statements.
   ii.   execute simple programs using looping statements.
   iii. execute simple programs using one-dimensional and two dimensional arrays.
   iv.   execute simple programs using strings, string functions and functions.
   v.   execute simple programs using structures /unions and pointers.

1. Programs on formatted input/output.

2. Programs using conditional statements.

3. Programs using looping statements.

4. Programs using one-dimensional array.

5. Programs using two-dimensional array.

6. Programs related to strings and string functions.

7. Programs using functions (Nesting of functions, recursion etc.)

8. Programs on structures and unions.

9. Basic programs using pointers.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding		2			
K3: Applying			3		
K4: Analysing				4	
K5: Evaluating					5
K6: Creating					

Mean= 3

MAT / MAS 1512   ALGEBRA - I   5Hrs / 5Cr

This is a basic course for any student aspiring to complete B.Sc., degree in Mathematics. The essence of mathematical logics and its ramifications in the study of mathematics is introduced. Basic properties of sets which are needed for the study of algebra are introduced. The students are exposed to the basic algebraic structure called group. Subsequently the properties of groups and imbedding a group in a bigger group called the group of symmetries are dealt with. The algebraic equivalence of any two groups is studied by means of isomorphism

At the end of the course, students will be able to

i.   identify and analyze statements with truth tables and examine the validity of the verbal (or) symbolic arguments using rules of inference.
ii. illustrate sets, relations and functions and prove the statements for the same.
iii. define a group and illustrate various types of groups including the most general type of group called group of permutation.
iv. demonstrate with examples on normal subgroups and quotient groups.
v.   analyze and infer the structural similarities between groups.

Unit 1: Statement - Negation – Disjunction – Statement formulas and truth tables – Conditional and Bi-conditional statements – Tautologies – Equivalence of formulas – Normal forms – Theory of inference and predicate calculus.

Unit 2: Introduction to set theory – Cartesian products – Relations – Properties of binary relations – Partition and covering of a set – Equivalence relations – Compatibility relation – Partial ordering – Functions – Peano axioms and mathematical induction.

Unit 3: Equivalent definitions of a group – Permutation groups – Cyclic group – Cosets – Lagrange's theorem.

Unit 4: Normal subgroup – Quotient group – Cayley's theorem.

Unit 5: Homomorphism – Isomorphism – Automorphism – Inner Automorphism – Fundamental theorems of homomorphism.

Text Books:
1. Tremblay.J.P, Manohar.R, Discrete Mathematical Structure with applications to Computer science, Tata McGraw – Hill, 2011.
    Unit 1: Chapter 1(sec 1.1 - 1- 2.11, 1.3 - 1- 3.4, 1- 4.2 and 1-6.4)

2. Arumugam. S, & Thangapandian Issac. A, Modern algebra, New gamma publication House, 2013.
        Unit 2: Chapter 1 (sec 1.0 -1.8) and Chapter 2 (sec 2.1 - 2.5)
   Unit 3: Chapter 3(sec 3.0 - 3.8)
   Unit 4: Chapter 3(sec 3.9 and 3. 10)
   Unit 5: Chapter 3(sec 3.11)

3. Dr. Venkataraman. M.K, Dr. Sridharan N, Chandrasekaran.N, Discrete Mathematics, The National Publication Company, 2013.
   Unit 2: Chapter 4 (sec 2)

Reference Books:
1. Vijay K. Khanna and Bhambri. S.K, A course in Abstract Algebra, 1998
2. Joseph A. Gallian, Contemporary Abstract Algebra,8th Edition, Brooks/Cole Cengage Learning, 2013.
3. Rao, Abstract Algebra, Vijay Nicole, 2012.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		
K4: Analysing				4	
K5: Evaluating					5
K6: Creating					

Mean = 3.4

MAT / MAS 1412   **ANALYSIS – I**   **4 Hrs / 4Cr**

In many ways, this course is the true gateway into the mathematics major, requiring rigorous proofs, introducing important topological concepts and laying the groundwork for Algebra and Topology.

At the end of the course, students will be able to

    i.   recall elementary properties of real numbers which lead to the Archimedean property, countability and uncountability.
   ii.   demonstrate with example, sequences which are convergent, divergent and oscillating. Enumerate properties of converging sequences and also identifies the algebraic operations on sequences
  iii.   outline the concept of Cauchy sequence. Demonstrate the existence of limit superior and limit inferior for any sequences. Existence of limit points in any bounded infinite sets is demonstrated.

iv.   demonstrate with example, series which are convergent and divergent. Enumerate properties of converging series and also identifies the algebraic operations on series.
v.   predict correct choice of test and apply for test of convergence of series.

Unit 1: The Algebraic and order properties of R – Supremum and Infimum – Completeness property of R – Archimedean property – Characterization of intervals – Countable sets –Uncountable sets.

Unit 2: Sequences – Limits of a sequence – Convergent sequences – Divergent sequences – Bounded sequences – Monotone sequences – Operations on convergent sequences – Operations on divergent sequences.

Unit 3: Limit superior – Limit inferior – Bolzano-Weierstrass theorem – Cauchy sequences.

Unit 4: Definition of infinite series – Sequence of partial sums – Convergence and Divergence – series with negative terms -Alternating series - Conditional convergence and Absolute convergence

Unit 5: Test for absolute convergence – Series whose terms form a non-increasing sequence.

Text Books:
1. Shanthi Narayanan & M.D Raisinghania, Elements of Real Analysis, S.Chand &Company Ltd., 2011.
          Unit 1: Chapter 1 (sec1.5), Chapter 2 (sec 2.2 - 2.8, 2.11)

2. Richard R. Goldberg, Methods of Real Analysis, Oxford & IBH publishing co. Pvt. Ltd, New Delhi, 2010.
          Unit 1: Chapter 1 (sec 1.5)
          Unit 2: Chapter 2 (sec2.1 - 2.8)
          Unit 3: Chapter 2 (sec 2.9, 2.10)
          Unit 4: Chapter 3 (sec 3.1 - 3.4)
          Unit 5: Chapter 3 (sec 3.6 - 3.7)

Reference Books:
1. 1Bartle. R.G and Sherbert. D.R, Introduction to Real Analysis, John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
2. Ross.K.A, Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics,Springer (SIE) Indian reprint, 2004.
3. Howie J.M, Real Analysis, Springer, 2007.
4. Ghorpade and Limaye, A course in Calculus and Real Analysis, Springer, 2006.
5. Deshpande. J.V, Mathematical Analysis and Applications, Alpha science International,2004.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3	3			
K4: Analysing			4	4	
K5: Evaluating					5

K6: Creating					

Mean=3.8

MAT / MAS 1414   INTEGRAL CALCULUS   4Hrs / 4Cr

This is a foundational course for any student aspiring to complete B.Sc. degree in Mathematics. The concept of integration as a limit of summation is introduced. The different methods of integration dealt with. The applications of integration in physical sciences, biological sciences and social sciences are discussed. The Beta and Gamma functions in terms of integration are introduced and their properties are studied in detail.

At the end of the course, students will be able to

   i.   evaluate integrals by recalling the formulae and using techniques of integration, such as substitution, partial fractions and integration by parts.
   ii.   recall the reduction formulae and evaluate the definite integrals.
   iii. distinguish and apply multiple integrals to find area, length of a curve and volume of solid revolution.
   iv.   evaluate double integrals using change of order of integration and change of variables.
   v.   illustrate the relation between Beta and Gamma functions and evaluate the definite integrals

Unit 1: Integration-Standard methods-Bernoulli's formula- Definite integral.

Unit 2:   Reduction formula- Integration as summation.

Unit 3: Geometrical Applications of Integration- Area Volume and length of the curve - Evaluation of Double and Triple Integrals.

Unit 4: Changing the order of Integration – Change of Variables-Applications in Double and Triple integrals.

Unit 5: Beta and Gamma functions- Recurrence formula for Gamma functions-Properties of Beta functions- Relation between Beta and Gamma functions.

Text Book:
Narayanan. S, and Manickavachagom Pillay.T.K, Calculus Vol. I and Vol. II, Viswanathan Pvt Ltd, 2002
   Unit 1: Chapter 1(sec 1 to 7.4, 8, 10 – 12, 15.1)
   Unit 2:   Chapter 1(sec 13.1- 13.10 and 15.2 – 15.3)
   Unit 3: Chapter 2(sec 1.1 – 1.4, 3, 4.1), Chapter 5(sec 2.2, 4)
   Unit 4: Chapter 5: Page no.208-213, Chapter 6(sec 2.2 – 2.4)
   Unit 5:   Chapter 7(Sec 2.1 – 2.3, 3 – 5)
Reference Book:
Arumugam.S and Thangapandian Isaac. A, Calculus Vol I and Vol II, New Gamma Publishing House, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding					
K3: Applying	3	3			
K4: Analysing			4	4	4
K5: Evaluating					
K6: Creating					

Mean=3.6

MAT1322   OBJECT ORIENTED PROGRAMMING IN C++   3Hrs / 3Cr

This is a supportive course for all students aspiring to complete B.Sc., degree in Mathematics. This course introduces the object oriented programming structure in C++ and develops the skills in writing programs.

At the end of the course, students will be able to

  i.   explain oops principles and distinguish between Structured and Object Oriented problem   solving approaches and apply them based on the problem given
  ii.   describe the functions, overloading functions, inline and friend functions
  iii. identify classes and objects from the given problem description and able to create classes and objects, constructors and destructors using C++
  iv.   explain Polymorphism with operator overloading and improve secured data processing by applying Abstraction and Encapsulation
  v.   analyse type conversions and create code reusability and extensibility by means of Inheritance

Unit 1: Principles of OOP-Objects- Classes – Inheritance – Reusability- Polymorphism and Overloading – tokens –expressions- Conditional statements- Looping statements- Console I/O.

Unit 2: Functions in C++ - Function prototyping- Call by reference- Return by reference- Default arguments- Constant arguments- Function overloading- Inline and Friend function.

Unit 3: Classes and objects-Specifying a class-Defining member functions- Nesting of memberfunctions- Private member functions- Private member functions- Array with a class-Staticmember functions- Array of objects - Constructor and Destructors.

Unit 4: Operator overloading-Overloading function- Overloading unary operators using member and friend functions- Overloading binary operators using member and friend functions.

Unit 5: Type conversion- Inheritance: levels of inheritance- Multiple inheritance- Multilevel inheritance- Hierarchical inheritance, Hybrid inheritance- Virtual base classes- Introduction to files.

Text Book:

Balagurusamy. E., Object Oriented Programming with C++, Tata McGraw-Hill, 2008.

> **Unit 1:** Sections 1.3-1.8; 2.1-2.8; 3.1-3.24
> **Unit 2:** Sections 4.1-4.11
> **Unit 3:** Sections5.3-5.18; 6.2-6.11
> **Unit 4:** Sections 7.1-7.8
> **Unit 5:** Sections8.1-8.9; 11.1-11.6

Reference Books:
1. H. Schildt, C++ complete reference, MC Graw Hill, 1995.
2. R. Rajaram, Object Oriented Programming and C++, New age international publishers,
3. New Delhi, 1998.
4. A.Chandra Babu & T. Joshuva Devadass, Programming with C++, Narosha Publishing
5. House Ltd., 2008.
6. P. Pandiyaraja, Object Oriented Programming with C++, S.Viswanathan Pvt.,Ltd., 2008.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		
K4: Analysing				4	4
K5: Evaluating					
K6: Creating					

Mean= 3.2

MAT 1102   OBJECT ORIENTED PROGRAMMING IN C++ LAB 2Hrs / 1Cr

The objective of the course is to learn the fundamental programming concepts and methodologies which are essential to build a C++ programs. Itenables them to write programs using these concepts and to practice them in the C++ programming language via laboratory experiences.

At the end of the course, students will be able to
  i. identify, formulate the techniques of software development in the C++ Programming Language
  ii. demonstrate these techniques by the solution of a variety of problems spanning the breadth of the language.
  iii. execute a program in different logic with suitable validations for a given problem
  iv. implement the techniques and features of the Object Oriented Programming to construct an application
  v. execute programs implementing inheritance for an application domain

1. Programs using scanf and printf statements.   (1h)
2. Programs using conditional statements.   (2h)
3. Programs using looping statements.   (2h)
4. Programs using functions (inline function, default arguments etc..)   (1h)
5. Programs using the concept of function overloading.   (1h)
6. Programs related to classes and objects.   (2h)

7. Programs using static member function and arrays of objects. (2h)
8. Programs using the concept of friend and virtual functions. (2h)
9. Programs on Constructors and Destructors. (2h)
10. Programs on Operator overloading. (2h)
11. Programs related to Inheritance. (2h)
12. Basic programs on files. (1h)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		
K4: Analysing				4	4
K5: Evaluating					
K6: Creating					

Mean= 3.2

MAT / MAS 2511   **ALGEBRA - II**   **5Hrs / 5Cr**

The objective of this course is to create awareness on the existing structures such as rings, fields, lattices and their relevance in the contemporary world. This course deals with basic ideas in Ring theory, Fields and Lattices.

At the end of the course, students will be able to

 i. Define rings and subrings and illustrate with examples.
 ii. Demonstrate with examples on ideals, integral domain, quotient rings and also illustrate with examples the properties of structure preserving maps.
 iii. Compare and contrast special types of fields.
 iv. Discuss at length the properties of polynomial rings.
 v. Outline the properties of lattices and Boolean algebra.

Unit 1: Introduction to Rings – Types of rings – Sub rings – Examples.

Unit 2: Ideals – Integral domain – Quotient rings – Maximal ideal – Prime ideal – Homomorphism of rings.

Unit 3: Introduction to Fields – Field of quotients – Ordered integral domain – Unique Factorization Domain – Euclidean Domain – Principal ideal domain.

Unit 4: Polynomial rings - Eisenstein Criterion.

Unit 5: Lattices – Modular Lattice -Distributive lattice– Boolean algebra - Boolean ring – Boolean functions – Canonical form.

Text Book:
    Arumugam. S and Thangapandian Isaac. A, Modern Algebra, SCITECH Publications Private Limited, 2006.

Unit 1: Chapter 4 (sec 4.1- 4.6)
Unit 2: Chapter 4 (sec 4.7- 4.10)
Unit 3: Chapter 4 (sec 4.11- 4.15)
Unit 4: Chapter 4 (sec 4.16- 4.18)
Unit 5: Chapter 9 (sec 9.0- 9.5)

Reference Books:

1. Sharma. J.N and Vashishtha. A.R, Linear Algebra, Krishna Prakasha Mandir, 1981.
2. Vijay K Khanna, Bhambri.S.K, A Course in abstract algebra, Vikas publishing house pvt. Ltd, 2013.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3			
K4: Analysing			4	4	4
K5: Evaluating					
K6: Creating					

Mean= 3.4

MAT / MAS 2513   **ANALYSIS - II**   **5Hrs / 5Cr**

The course deals with metric spaces which is a classical extension of the real line and its properties in terms of the distance. The course introduces to the students, metric spaces and its properties. The properties like connectedness, completeness and compactness which are inherent in nature in the real line are extended to the metric spaces. Also properties like continuity and uniform continuity are exploited.

At the end of the course, students will be able to
  i.   recall the definition of the limits and use it to identify the continuity / discontinuity of a function at a point. Utilize effectively the consequences of Intermediate value theorem and make conclusions.
 ii.   explain in detail a metric space as an abstraction of the real line and its distance property which leads to the definition of open sets, closed sets, closure of a set, interior of a set and dense set. Compare and contrast the definition of continuity in the real line and in any metric space. Distinguish continuity and uniform continuity with examples.
iii.   demonstrate connectedness and correlate the relation between the space and its image under a continuous map with reference to connectedness.
 iv.   describe completeness and its relation with totally boundedness.
  v.   describe compactness of a metric space and compile all equivalent definitions.

Unit 1: Introduction to limits - Limit and continuity - Continuous Functions- Discontinuity – Types of discontinuity - Intermediate value theorem and its consequences.

Unit 2: Metric spaces- Open sets- Limit point- Closed sets- Closure of a set- Properties of

closure of a set- Interior of a set- Properties of interior of a set- Dense sets- Nowhere dense sets - Limits in metric spaces- Reformulation of definition of continuous functions- Baire's theorem- Uniform continuity.

Unit 3: Connected metric spaces- Separated sets- Connected and Disconnected sets- Connectedness of product of connected metric spaces- Continuity and Connectedness.

Unit 4: Completeness - Totally Boundedness.

Unit 5: Compact metric spaces- Continuous functions on compact metric spaces- Continuity of the inverse function - Bolzano-Weierstrass theorem.

Text Books:
1. Shanthi Narayan and Raisinghania.M.D, Elements of Real Analysis, Sultan Chand & Company Limited, 2010.
   Unit 1: Chapter 8 (Sec 8.4-8.6, 8.11-8.14, 8.16, 8.17)

2. Arumugam Issac, Modern Analysis, New Gamma Publishing House, 2006.
   Unit 2: Chapter 2
   Unit 3: Chapter 5
   Unit 4: Chapter 3
   Unit 5: Chapter 6

Reference Books:
1. Richard R. Goldberg, Methods of Real Analysis, New Delhi: Oxford &IBH Publishing Company Private Limited 2002.
2. Sharma. J.N and Vasistha .A.R, Real Analysis, Krishna Prakashan Media (P) Limited, 1997.
3. Bartle .R.G.and Sherbert .D.R., Introduction to Real Analysis, Singapore: John Wiley and sons (Asia) Private Limited 2002.
4. Ross .K.A, Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint, 2004.
5. Howie .J.M, Real Analysis, Springer, 2007.
6. Shirali, S. and H.L.Vasudeva, Metric Spaces, Springer, 2001.
7. Malik, S.C. and Savita Arora, Mathematical Analysis, New Age International Publishers, 2001

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		
K4: Analysing				4	
K5: Evaluating					5
K6: Creating					

Mean= 3.4

MAT / MAS 2515   **DIFFERENTIAL EQUATIONS**   **5Hrs / 5Cr**

The objective of this course is to enable the students to solve various types of differential equations and to apply them in various fields. The topics covered includes formation of differential equations, solving various types of ordinary and partial differential equations, Laplace transforms and Laplace transforms as tool for solving differential equations.

At the end of the course, students will be able to
  i. identify and solve different types of first order ordinary differential equation.
  ii. identify and determine the solutions of second order differential equation. Also evaluate simultaneous differential equations.
  iii. determine standard forms of partial differential equations, reduce equations to standard forms and hence solve using Lagrange's and Charpit's method.
  iv. create and enlist the properties of Laplace transforms and Inverse Laplace transform from the basics to use as a tool to solve differential equations.
  v. demonstrate the effective use of the new tool (Laplace Transforms) developed to solve differential equations with constant and variable coefficients.

Unit 1: Ordinary differential equation – Non-Homogeneous equations of the first degree in x and y – Bernoulli's equation -First order and first degree exact equation – Integrating factors – Equations of the first order but of higher degree – Equations solvable for p, y and x and Clairaut's form.

Unit 2: Linear differential equations with constant coefficients – Particular integrals – Second order homogeneous equations with variable coefficients – Equations reducible to the linear homogeneous equations – Variation of parameters – Simultaneous differential equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ -n$^{\text{th}}$ order exact differential equations – Orthogonal trajectory.

Unit 3: Partial differential equations of the first order – Derivation of partial differential equations – Classification of integrals – Lagrange's method of solving linear Partial differential equations – Standard forms – Equations reducible to the standard forms.

Unit 4: Laplace transforms – Developing the theory to use it as a tool - Laplace transform of periodic functions – Some general theorems – Evaluation of integrals – Inverse Laplace transform.

Unit 5: Solving ordinary differential equation with constant coefficients, variable coefficients and simultaneous linear equation using Laplace transform.

Text Books:
  1. Narayanan.S and ManickavachagomPillay.T. K, Calculus Vol III, S.Viswanathan Private Limited, 2012.
        Unit 1: Chapter 1 (sec 1.1 - 6.1)
        Unit 2: Chapter 1 (sec 8.1), Chapter 2 (sec 1- 4 and 8-10),
        Chapter 3 (sec 2 – 4)
        Unit 3: Chapter 4 (sec 1- 7)
        Unit 4: Chapter 5 (sec 1- 7)
        Unit 5: Chapter 5(sec 8-10)
  2. Raisinghania. M. D , Ordinary and Partial Differential Equations , S. Chand and Company Ltd, New Delhi, 1997.
        Unit 2: Part II- ODE, Chapter 3(sec 3.1- 3.4).

Reference Books:
1. NarayananS and ManickavachagomPillay.T.K, Differential Equations,S.Viswanathan Private Limited, 1996.
2. Arumugam.S and ThangapandianIsaac.A,Differential Equations, New Gamma Publishing House, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3			3
K4: Analysing			4	4	
K5: Evaluating					
K6: Creating					

Mean= 3.2

MAT / MAS 2411   STATISTICS – I   4Hrs/ 4Cr

The objective of the course is to enable the students to understand the theoretical background of statistics as a student of Mathematics. The course essentially deals with the probability distribution theory which is the basis of statistics. The topics covered includes Correlation and Regression and curve fitting.

At the end of the course, students will be able to
  i. demonstrate with example a sample space. Outline the role of probability density function in determining the nature of probability.
  ii. apply the moment generating function to determine moments and the relation to mean, standard deviation and variance. Measure the dispersion of the data of any distribution by chebychev's inequality.
  iii. identify and apply various distributions to solve problems.
  iv. evaluate the relation between different data.
  v. fit the appropriate curve using the methods of least squares.

Unit 1: Sample space – Random Variable-Discrete and continuous Distribution function-Probability density function - joint probability function.

Unit 2: Mathematical expectation and generating functions – Moment generating function-Chebychev's inequality - Law of large numbers.

Unit 3: Theoretical Discrete and continuous distributions- Binomial, Poisson, Normal, Gamma, Exponential, Rectangular, Uniform distributions- Standard properties.

Unit 4: Correlation and Regression.

Unit 5: Method of least squares – Curve fitting- linear, polynomial, exponential and logrithimic.

Text Books:

1. Arumugam.S and ThangapandianIsaac.A, Statistics, New Gamma Publications Private Limited, 2003.
   Unit 1: Chapter 12 (sec 12.1-12.3)
   Unit 2: Chapter 12 (sec 12.4 -12.6)
   Unit 3: Chapter 13
   Unit4: Chapter 6(sec 6.1- 6.4)
   Unit 5: Chapter 5

2. Gupta.S.C and Kapoor.V.K, Mathematical Statistics, Sultan Chand and Sons 2001.
   Unit 1: Chapter 5 (sec 5.5.1-5.5.4)
   Unit 2: Chapter 6 (sec 6.12, 6.13, 6.13.1)
   Unit 3: Chapter 8 (sec 8.1, 8.3, 8.6)

Reference Book :

1. Manmohan Gupta, Statistics, Sultan Chand and Sons, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	3
K4: Analysing			4		
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 2512   **ALGEBRA - III**   **5Hrs / 5cr**

The objective of this course is to enable the students to understand the basic ideas of vector spaces are as algebraic structure, linear transformations and their relations to matrices arealso dealt with. The topics covered in this course are vector spaces, inner product space, lineartransformations and matrix of linear transformation.

At the end of the course, the students will be able to

   i.   explain the fundamental concepts of vector space and its associated spaces.
  ii.   predict the dimension of a vector space through an analysis on spanning set, linear independent set and basis.
 iii.   demonstrate the structural intricacy of vector spaces effected by linear transformations.
 iv.   illustrate the knowledge of inner product spaces as a special case of vector spaces and its applications.
  v.   demonstrate the use of the Gram Schmidt orthogonalization process to find the orthonormal basis and its relavant.

Unit 1: Vector space – Subspace – Quotient space.

Unit 2: Spanning set – Linear independent set- Basis – Dimension.

Unit 3: Linear transformations - Rank and Nullity of a linear transformation – Matrices - Linear transformations – Vector space of linear transformations.

Unit 4: Inner product space –Properties – norm and distance- Schwartz inequality, triangle inequality.

Unit 5: Orthogonal elements – Orthonormal set – Gram-Schmidt orthogonalization process – orthogonal complement.

Text Books:
1. Vijay K Khanna, Bhambri.S.K, A Course in Abstract algebra, Vikas publishing house Pvt. Ltd,2013.
   Unit 1: Chapter 10 (page 392-403)
   Unit 2: Chapter 10 (page 411-437)
   Unit 3: Chapter 10 (page 404-410 & 453-479)
2. Arumugam.S. and Thangapandian Isaac. A, Modern Algebra, SCITECH Publications Private Limited, 2006.
   Unit 4: Chapter 6 (sec 6.0-6.1)
   Unit 5: Chapter 6 (sec 6.2-6.3)

Reference Book:
   Sharma. J.N and Vashishtha.A.R, Linear Algebra, Krishna Prakasha Mandir, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3	3	
K4: Analysing					4
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 2514   **ANALYSIS - III**   **5Hrs / 5Cr**

The first two semesters of the degree programme introduced calculus which includes differentiation and integration where integration was treated as the reverse process of differentiation. However, the Riemannian definition of integration gave a twist to the way it is looked at. Students are introduced to integration as a limit of summation by Riemann integration. The Riemann integrability of a function is looked at in detail. The necessary and sufficient condition for Riemann integrability is the central theme of this course. Sequence of functions and their limits are introduced (pointwise limit and uniform limit). The ramifications of uniform convergence and their ramifications on integrability, differentiability and continuity are dealt in depth.

At the end of this course, students will be able to

i.   define the Riemann integration of a bounded function on a closed interval. Identify the necessary and sufficient conditions for the existence of the integral and enumerate the properties of Riemann's integral.

ii.   define the derivative of a function and deduce its properties.
iii. design Taylor's formula and its ramifications as a consequence of Mean value theorem for intervals.
iv.   define and distinguish the difference between point wise convergence and uniform convergence. Enumerate the consequences on the uniform limit of the sequence of the functions which are integrable, differentiable and continuous.
v.   discuss the convergence and uniform convergence of series of functions using standard tests. Enumerate the consequences on the uniform limit of the series of the functions which are integrable, differentiable and continuous.

Unit 1: Riemann Integration - Riemann Integrable Functions - Properties of the Riemann integral- Characterization theorem on Reimann integrable functions.

Unit 2: Derivatives - chain rule - Darboux's theorem - Rolle's Theorem - Law of the mean – The Fundamental theorem of calculus -Substitution theorem and application – improper integrals.

Unit 3: Taylor's theorem with Lagrange and Cauchy form of remainders- Taylor series- Maclaurin series - convex functions.

Unit 4: Point wise and uniform convergence of sequence of functions - uniform convergence and continuity - uniform convergence and differentiation - uniform convergence and integration -Cauchy criterion for uniform convergence.

Unit 5: Series of functions - convergence and uniform convergence of series of functions – Weierstrass M-Test - Dini's theorem for series - differentiation and integration of series of functions- power series - radius of convergence.

Text Book:
1. Richard R.Goldberg, Methods of Real Analysis, New Delhi: Oxford & IBH Publishing Company Private Limited, 2002.
        Unit 1: Chapter 7 (Sec 7.1-7.4)
        Unit 2: Chapter7 (Sec 7.5-7.8)
        Unit 3: Chapter 8 (Sec 8.5)
        Unit 4: Chapter 9 (Sec 9.1-9.3)
        Unit 5: Chapter 9 (Sec 9.4, 9.5)

Reference Books:
1. Sharma. J.N and Vasistha. A.R, Real Analysis, Krishna Prakashan Media (P) Ltd, 1997.
2. Bartle.R.G and Sherbert. D.R, Introduction to Real Analysis, Singapore: John Wiley and Sons (Asia) Private. Limited, 2002.
3. Ross. K.A,   Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint, 2004.
4. Howie J.M, Real Analysis, Springer, 2007.
5. Deshpande J.V, Mathematical Analysis and Applications, Narosa Publishing House, 1999.
6. Torence Tao, Analysis I, TRIM 37, Hindustan Book Agency, 2000.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5

Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3				
K4: Analysing		4	4	4	
K5: Evaluating					5
K6: Creating					

Mean= 3.2

MAT / MAS 2516   VECTOR CALCULUS & TRIGONOMETRY   5Hrs / 5Cr

This is a foundational course for any student aspiring to complete B. Sc degree in mathematics. The applicability of the subject is enormous in nature. The first unit is primarily devoted for the basics on vectors. Trigonometry is an inevitable part of any branch of science, Demovire's theorem and its applications are exploited.
At the end of the course, the students will be able to

   i.   compute dot and cross products. Utilize these concepts to interpret geometrical properties of two or three dimensional objects
   ii. analyze the differentiability of the functions by defining gradient, divergent and curl.
   iii. demonstrate the interdependency of gradient, divergent and curl by making use of relevant theorems.
   iv. demonstrate the use of the Demovire's theorem in calculating the nth root of unity and its consequences in the power series of sines and cosines and series of sines and cosines of multiples of θ.
   v.   formulate the analytic expression of Hyperbolic functions, logarithmic functions involving complex variables by using trigonometric summation.

Unit 1: Introduction to vectors- dot product and cross product of vectors- product of three and four vectors- geometrical interpretation of dot and cross product and their related aspects- volume of parallelepiped- tetrahedron-vector equation(lines, circles etc.,) algebraic equations and geometrical interpretations- problems related to aforesaid aspects on vectors.

Unit 2: Limit of a vector function- continuity- Differentiation of vectors- Taylor's theorem for vector functions- Partial derivatives- differentiability of vector functions- related problems- Definition of gradient, divergent and curl with physical interpretation- Curvilinear coordinates- cylindrical and spherical coordinates.

Unit 3: Vector integration- Indefinite integrals- Definite integral- Line, surface and volume integrals- Green's theorem in plane – Green's theorem in space- Stoke's and Gauss theorems- problems related to the verification of these theorems- Vector integrations.

Unit 4: Demovire's theorem- Geometrical interpretation- Simplification of trigonometric function- Expansion of trigonometric functions.

Unit 5: Hyperbolic functions- Logarithmic functions- Trigonometric summation of series.

Text Books:
1. Narayanan and Manichavasagom pillai, Vector algebra and analysis, M. S. Viswanathan pvt ltd, 1986.

> **Unit 1**: ChapterI(sec 1-5,7,10), Chapter II(sec1-8,11-14),
>
> Chapter III(sec2,3,4.5- 4.8, 5, 6)
>
> **Unit 2**: Chapter IV (sec1-12)
>
> **Unit 3**: Chapter VI (sec1-7, 9, 10)

2. Narayanan and Manichavasagom Pillai, Trigonometry, M. S. Viswanathan pvt ltd, 1986.

> **Unit 4:** Chapter II (sec 3,5), Chapter III(sec1-5excluding 5.1)
>
> **Unit 5:** Chapter IV (sec 1-2excluding 2.3), Chapter V (sec 5),
>
> Chapter VI (sec 1-3 excluding 3.1, 3.2)

Reference Books:
1. Raisinghania M. D, Vector Calculus, S. Chand company ltd, 1998.
2. Dipak chatterjee, Vector Analysis, Prentice Hall of India, New Delhi, 2003.
3. Arumugam and Thangapandi Issac, Trigonometry, New gamma publication, 2003.
4. Chandra Babu. A and Seshan C.R , New Engineering mathematics, volume – II, Narosa Publishing house, Chennai, 2006.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3	3	
K4: Analysing					4
K5: Evaluating					
K6: Creating					

Mean= 3

MAT/MAS 2412   **STATISTICS - II**   **4Hrs/ 4Cr**

This is the second segment of a sequential course as a tool for solving problems in real life. The aim of this course is to enable the students to understand statistics. The course deals with analysis of variance- analysis of time series and statistical quality control.

At the end of the course, the students will be able to

   i.   outline basic principles in sampling also apply testing hypothesis on large samples at appropriate situations.
   ii.   apply testing hypothesis on small samples at appropriate situations.
   iii.   analyze various index numbers and formulate the procedure to measure the change in the variable over the period of time.
   iv.   predict the future values based on previously observed values using concept of the time series.
   v.   evaluate the interdependency of two or more variables.

Unit 1: Sampling and Large sample tests.

Unit 2: Small sampling tests using t- F- and Chi-square distributions.

Unit 3: Index numbers – fixed and chain base indices – cost of living index – consumer price index – ideal index number.

Unit 4: Analysis of time series – components of time series – measurement of trend – seasonal variations.

Unit 5: Analysis of variance – one way- two way classification -Latin square design.

Text Book:

Arumugam.S. and Thangapandian Isaac. A., Statistics, New Gamma Publications Private Limited, 2003.
        Unit 1: Chapter 14
        Unit 2: Chapter 15 and 16
        Unit 3: Chapter 9
        Unit 4: Chapter 10
        Unit 5: Chapter 17

Reference Books:

1. Gupta.S.C and KapoorV.K, Mathematical Statistics, Sultan Chand & Sons, 2001.
2. GuptaS.P, Statistical Methods, Sultan Chand and Sons, 2001.
3. Manmohan Gupta, Statistics, Sultan Chand & Sons , 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	3
K4: Analysing			4		
K5: Evaluating					
K6: Creating					

Mean=5

MAT / MAS 3611   MECHANICS   6Hrs / 6Cr

The course mainly deals with two major areas of applied mathematics namely Statics and Dynamics. Statics is the branch of mechanics that is concerned with the analysis of loads (force and torque, or "moment") acting on physical systems that do not experience an acceleration (a=0), but rather, are in static equilibrium with their environment. Whereas the dynamics is a branch of applied mathematics (specifically classical mechanics) concerned with the study of forces and torques and their effect on motion. Brief introduction to central forces to the learners becomes essential as we live in the era of satellites, missiles and space explorations.

At the end of the course, students will be able to

i.   outline basics that are governing system of forces.
ii.   explain the idea of couples and illustrate equilibrium of three forces acting on a rigid body in appropriate physical systems.
iii. examine resultant of coplanar forces under various circumstances. Define and apply the concept of friction.
iv.   define principles of conservation of momentum and apply the concept of direct impact and oblique impact in collision of objects.
v.   describe the orbit of a moving particle under the action of central forces and compute moment of inertia.

Unit 1: Introduction – Forces acting at a point – Lami's theorem – Components of force – Parallel forces and moments – Moment of a force.

Unit 2: Couples– Equilibrium of three forces acting on a rigid body.

Unit 3: Coplanar forces – Friction.

Unit 4: Collision of elastic bodies – Principles of conservation of momentum– Direct impact– Oblique impact.

Unit 5: Motion under the action of central forces– Law of inverse squares–Moment of inertia.

Text Books:
   1. Venkatraman. M.K, Statics, Agasthiar publications, 2002.
            Unit 1: Chapter: 1 to 3.
Unit 2: Chapter: 4,5($1 - 6)
Unit3: Chapter: 6($1-13),7 ($1 -12).

   2. Venkatraman. M.K, Dynamics, Agasthiar publications, 2002.
Unit 4: Chapter 8: § 8.1 - 8.8.
Unit 5: Chapter11: §11.1to 11.9, § 11.14, Chapter12: § 12.1 - 12.4.

Reference Books:
   1. Loney. S.L, Dynamics, Mac Millan India Edition, 1998.
   2. Rajeshwari. I, Mechanics, Sarah's publications, 2016.
   3. Vasistha and Agarwal, Dynamics of a particle, Krishna prakash mandir, Meeret, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3				
K4: Analysing		4	4		
K5: Evaluating				5	5
K6: Creating					

Mean= 4.2

MAT / MAS 3613 **GRAPH THEORY** **6 Hrs / 6 Cr**

A graph is a symbolic representation of a network and of its connectivity. It implies an abstraction of the reality so it can be simplified as a set of linked nodes. Graph theory is a branch of mathematics concerned about how networks can be encoded and their properties measured. It has been enriched in the last decades by growing influences from studies of social and complex networks. The origins of graph theory can be traced to Leonhard Euler who devised in 1735 a problem that came to be known as the "Seven Bridges of Konigsberg".

At the end of the course, the students will be able to

  i. demonstrate graphs with examples and represent a graph by matrices.
  ii. identify and construct Eulerian and Hamiltonian graphs .
  iii. describe the properties of trees and able to examine minimal spanning tree for a given weighted graph.
  iv. discuss coloring concept of vertices and edges of a graph
  v. analyze planar graphs and its properties, and classify the connectedness of directed graph.

Unit 1: Graphs– Sub graphs– Isomorphism and degrees – Degree sequence – Walks and connected graphs – Cycles in graphs – Cut vertices and cut edges – Connectedness – Ramsay number – Matrices associated with the graph – Operations on graphs.

Unit 2: Eulerian graphs – Hamiltonian graphs –Properties.

Unit 3: Bipartite graph – Trees.

Unit 4: Colouring – Vertex colouring – Edge colouring – Five colour theorem and Four colour conjecture – Chromatic number and chromatic polynomials.

Unit 5: Independence number – Covering number – Planar graph–Dual graph of planar graph –Directed Graph.

Text Books:

  1. Choudum .S.A., A First Course In Graph Theory, McMillan India Ltd, 1987.

      Unit 1: Chapter 1(sec1.1-1.7), Chapter 4(sec 4.1)
      Unit 2: Chapter 2(sec2.1-2.4)
      Unit 3: Chapter 3(sec3.1-3.4)
      Unit 4: Chapter 6(sec6.1-6.3)
      Unit 5: Chapter 5(sec5.1-5.4), Chapter 7(sec7.1-7.5)

  2. Arumugam.S and Ramachandran.S, Invitation to Graph Theory, New Gamma Publishing House, 1996
      Unit 1: Chapter 2(sec 2.5, 2.9), Chapter 3(sec 3.1-3.2)
      Unit 5: Chapter 2(sec 2.6)

Reference Books:

1. John Clarke & Derek Allan Holton, A first Look at Graph Theory, World Scientific Publishing Co. Ltd., 1995.
2. Murugan. M, Graph Theory and Algorithms, Muthali publishing house, 2003.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3			3
K4: Analysing			4	4	
K5: Evaluating					
K6: Creating					

Mean = 3.2

MAT / MAS 3615   OPERATIONS RESEARCH – I   6 Hrs/6 Cr

This course aims to develop students to use quantitative methods and techniques for effective decision making, mathematical model formulation and applications that are used in solving real life problems.

At the end of the course, students will be able to
   i.   formulate Linear Programming Problem (LPP), find its solution by graphical method and identify the special cases of solution.
   ii.   predict solutions of different types of LPP using appropriate methods, namely, simplex, Big M and two-phase method
   iii.   exploit the concept of dual simplex method and solve LPP.
   iv.   solve transportation and assignment problems using primal dual algorithm and extend it for special cases.
   v.   propose the best strategy in a game using different decision making tools.

Unit 1: Introduction– Formulation of L.P.P. – Graphical solution of L.P.P. and its special cases – Canonical form, Standard form and Basic solution – Basic feasible solution – Reduction of feasible solution to a basic feasible solution.

Unit 2: The Simplex method – Introduction – Simplex method – Big M method – Two phase Method.

Unit 3: Duality in Linear Programming – Concept of duality – Formulation of dual linear problem – Formulation of primal-dual pairs – Dual simplex method – Revised simplex method.

Unit 4: The Transportation Problem - Introduction- Mathematical formulation- Loops in a transportation table- Finding IBFS- moving towards optimality – Degeneracy – Unbalanced transportation problems -The Assignment problem – Introduction – Hungarian method - Variations of the Assignment problem – Multiple optimal solutions – Maximization case -Travelling salesman problem –Unbalanced assignment problem- Restrictions.

Unit 5: Introduction to theory of Games – Saddle Point – Graphical solution for 2 x m, n x 2 Dominance property – Solution of game by linear programming method.

Text Book:

Kantiswarup, Gupta P.K. & Manmohan, Operations Research, Sultan Chand & Sons, 2010.
> **Unit 1:** Chapter 1, 2 & 3
> **Unit 2:** Chapter 4
> **Unit 3:** Chapter 5, 9.1, 9.2
> **Unit 4:** Chapter 10, 11
> **Unit 5:** Chapter 17

Reference Books:
1. Sharma.J.K. Operations Research, Theory and applications, Macmillan, New Delhi, 2003.
2. Goel. B.S. and Mittal, S.K. Operations Research, Pragati Prakashan, Meerut, 2000.
3. Hadley.G, Linear Programming, Narosa Book Distributors Private Ltd. ,1963.
4. Taha.H.A. Operations Research – An Introduction (8th Edition) Prentice Hall of India, New Delhi, 2007.
5. Bronson.R, Operations Research 2nd Edition, Schaum's Outline Series, 1997.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		3
K4: Analysing				4	
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 3511   **COMBINATORICS**   **5 Hrs / 5Cr**

Combinatorics is a branch of mathematics concerning the study of finite or countable discrete structures. Aspects of combinatorics include counting the structures of a given kind and size (enumerative combinatorics), deciding when certain criteria can be met, and constructing and analyzing objects meeting the criteria. Many combinatorial questions have historically been considered in isolation, giving an adhoc solution to a problem arising in some mathematical context. In the later twentieth century, however, powerful and general theoretical methods were developed, making combinatorics into an independent branch of mathematics in its own right. Combinatorics is used frequently in computer science to obtain formulas and estimates in the analysis of algorithms.

At the end of the course, the students will be able to

i. demonstrate effectively the addition and multiplication principles and use it for counting.
ii. use generating functions and the concept of partition to solve combinatorial problems.
iii. model recurrence relations using different techniques for real time counting problems and find solutions.

iv. outline special counting numbers such as Fibonacci number, Stirling numbers, catalan number and Menage number.
v. design a new counting principle called inclusion and exclusion principle and use it for counting problems.

Unit 1: Two basic principles – Simple arrangement and selections with or without repetition – Distributions – Binomial coefficients.

Unit 2: Generating functions - Calculating coefficients of generating functions – Exponential generating function – Summation method – Partitions.

Unit 3: Recurrence relations – Divide and conquer relations – Dearrrangement – Solution of linear recurrence relation.

Unit 4: Fibonacci number - Stirling number of first and second kind – Catalan number– Ménage number.

Unit 5: Inclusion and Exclusion principle – Pigeon hole principle – Ramsey theorem.

Text Books:

1. Tucker A.W., Applied Combinatorics, Wiley, 2011.
   Unit 1: Chapter 5
   Unit 2: Chapter 6
   Unit 3: Chapter 7(sec 7.1 - 7.3).
   Unit 4: Chapter 8(sec 8.1, 8.2 and Appendix A4).

2. Schaum's outline series, Combinatorics, Tata McGraw-Hill Publishing Company Ltd 2005.
   Unit 5: Chapter 1(sec 1.112, 1.114, 1.132, 1.134, 1.146, 1.147, 1.148, 1.149, 1.150), Chapter 2 (sec 2.73), Chapter 3 (sec 3.64)

Reference Books:
1. Cohen D., Combinatorics, Wiley, 1978.
2. Hall M., Combinatorial Mathematics, McGraw Hill, 1968.
3. Liu C.L., Introduction to Combinatorial Mathematics, McGraw-Hill, Newyork, 1994.
4. Ryser H.J., Combinatorial Mathematics, Carus Mathematical monograph, 1965.
5. Krishnamurthy, Combinatorics, PHI, 1998.
6. Balakrishnan V.K., Combinatorics, Schaum's outline series, Tata McGraw Hill, 2005.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	3
K4: Analysing			4		
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 3200   **ENVIRONMENTAL STUDIES**   **4 Hrs / 2Cr**

An environmental study is a multidisciplinary academic field which systematically studies human interaction with the environment in the interests of solving complex problems. Environmental study brings together the principles of sciences, commerce/ economics and social sciences so as to solve contemporary environmental problems. It is a broad field of study that includes the natural environment, built environment, and the sets of relationships between them. The field encompasses study in basic principles of ecology and environmental science, as well as associated subjects such as ethics, geography, policy, politics, law, economics, philosophy, environmental sociology and environmental justice, planning, pollution control and natural resource management.

At the end of the course, the students will be able to

   i.   explain different types of ecosystem, relation between food chain and ecological pyramids, determine geographical classification and conservation of bio-diversity.
   ii.   create awareness on environmental pollution issues, its effects on ecosystem and measures to control and conserve the natural environment.
  iii.   analyze energy resources and know the optimal utilization of energy resources.
  iv.   describe environmental ethics, awareness on solid waste management and emphasize house hold environment and health.
   v.   create mathematical models for environmental issues using differential equation, linear programming and chaos theory and hence obtain solution for environmental issues.

Unit 1: Understanding eco-system –Food chain –Ecological pyramids – Introduction to different eco-system – Bio-geographical classification of India – Hot spots of bio-diversity – Conservation of bio-diversity.

Unit 2: Introduction to Environmental Pollution – Causes and effects of air, water, noise, soil, thermal and nuclear pollution – Measures of control and management – Oil sleek and its effects on the marine eco system – Global warming and climate change – Acid rain– Ozone layer depletion – Nuclear accident and holocaust.

Unit 3: Energy sources – Renewable- Non renewable energy sources – Nuclear energy – Bio fuels – Non conventional energy sources – Pollution free energy.

Unit 4: Social Issues – Urbanization and pollution – Hazard identification – Air quality standards – Major pollutants and their effects in an urban environment – Permissible limits and methods of control – Environmental ethics – Environmental protection act – Environmental auditing (Air, water, wildlife protection, forest conservation acts) – Public awareness on solid waste management – House hold environment and health.

Unit 5: Mathematical modeling for environmental issues –Weather/ disaster predictions – mathematical models using differential equations, linear programming and chaos theory.

Text Book:

Erach Bharucha, Textbook of Environmental Studies, Universities Press, 2005.

Unit 1: Section 3.1.1, 3.4, 3.6, 3.7, 4.2, 4.6, 4.9
Unit 2: Section 5.1, 5.2, 6.6
Unit 3: Section 2.2, 2.3
Unit 4: Section 6.2, 6.5, 6.9 – 6.13, 5.4
Unit 5:http://math.unipa.it/~grim/Jferruccicarter.PDF

Reference Books:
1. Rana, Essentials of ecology and Environmental science, S.V.S. PHI, 2003.
2. Subramanian,N.S. & Sambamoorthy-A.V.S.S Ecology, Narosa publishing house, 2000.
3. Dr.Raman Sivakumar, Introduction to environmental science and energy, 2005.
4. Dr.Raman Sivakumar, Introduction to Environmental Science and Engineering, 2005.
5. Dr.Ravikrishnan.A, Environmental Science and Engineering, Sri Krishna Hitech
6. Publishing Company Pvt. Ltd, 2010.
7. Arumugam.N, Kumaresan.V, Environmental studies, Saras Publication, 2010.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3		3
K4: Analysing				4	
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 3612   NUMBER THEORY   6 Hrs / 6 Cr
The study of number theory inevitably includes knowledge of the problems and techniques of elementary number theory, however the tools which have evolved to address such problems and their generalizations are both analytic and algebraic, and often intertwined in surprising ways. This course covers topics from classical number theory including discussions of mathematical induction, prime numbers, division algorithms, congruences, and quadratic reciprocity.

At the end of the course, the students will be able to

i.   recall the basic concepts of divisibility.
ii.   demonstrate renowned theorems in solving congruences.
iii. discuss on quadratic congruence equations.
iv.   analyze various arithmetical functions.
v.   identify the numbers of special form and apply divisibility rules in solving Diophantine equations.

Unit 1: Divisibility– Euclidean algorithm – Primes – Fundamental theorem of arithmetic.

Unit 2: Congruences – Fermat, Euler and Wilson theorem – Lagrange theorem – Chinese remainder theorem – Solution of congruences.

Unit 3: Quadratic residues – Euler's criterion – Gauss lemma – Quadratic reciprocity law.

Unit 4: Arithmetic functions – Number of divisors– Sum of divisors – Euler's phi function –Mobius function – Mobius inversion formula – Greatest integer function – Related problems.

Unit 5: Numbers of special form – Perfect Numbers – Mersenne primes and amicable numbers – Fermat numbers – Pepin's test – Diophantine Equation – Pythagorean triplets.

Text Book:

Burton. D. M, Elementary Number theory, Universal book stall, 2012.

> **Unit 1**: Chapter 2 (sec2.1-2.4), Chapter 3(sec3.1)
> **Unit 2:** Chapter 2(sec 2.5), Chapter 4(sec4.2-4.4), Chapter 5(sec 5.2-5.3)
> **Unit 3**: Chapter 9 (sec 9.1-9.3)
> **Unit 4:** Chapter 6 (sec6.1-6.3), Chapter 7(sec 7.2-7.4)
> **Unit 5:** Chapter 11(sec11.2-11.4), Chapter 12(sec12.1)

Reference Books:

1. Andrews. G. E, Number theory, Hindustan Publishing Corporation, 1994.
2. Apostol. T. M, Introduction to analytic number theory, Narosa publishing house, 1998.

3. Niven. I and Zuckerman.H.S, An introduction to the theory of numbers, Wiley eastern, 2015.
4. Narayanan. S and Manicavachagom Pillay. T.K, Algebra, Vol. I, S. Viswanathan printers and publishers, 2012.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	
K4: Analysing			4		4
K5: Evaluating					
K6: Creating					

Mean= 3.2

MAT / MAS 3614   COMPLEX ANALYSIS   6 Hrs / 6Cr

Complex analysis, traditionally known as the theory of functions of a complex variable, is the branch of mathematical analysis that investigates functions of complex numbers. It is useful in many branches of mathematics, including algebraic geometry, number theory, analytic

combinatorics, applied mathematics; as well as in physics, including hydrodynamics and thermodynamics and also in engineering fields such as nuclear, aerospace, mechanical and electrical engineering.

At the end of the course, the students will be able to

i. explain the geometry of complex numbers. Demonstrate bilinear transformation as composition of elementary transformations. Compile the relation between bilinear transformation and cross ratio.
ii. differentiate differentiability and analyticity. Characterize analytic function with Cauchy Riemann equations and further properties of partial derivatives.
iii. outline the procedure for integration of complex functions. Use cauchy's integral formula and its consequences to prove most important theorems.
iv. compute power series expansion in connected region, annular region of an analytic function.
v. identify different types of singularities and poles, calculate the residue. Use contour integration to find integrals of real valued functions of certain type.

Unit 1:Geometry of complex numbers – Elementary transformations – Bilinear transformations – Cross Ratio – Fixed points of bilinear transformation.

Unit 2: Analytic function – Differentiability – The Cauchy Riemann equation – Conformal mappings.

Unit 3: Definite Integral – Cauchy's Theorem – Cauchy's Integral formula – Cauchy's inequality – Morera's theorem – Liouville's theorem and fundamental theorem of Algebra – Maximum modulus theorem.

Unit 4: Taylor's and Laurent's theorem – Zeros of an analytic function.

Unit 5: Singularities – Cauchy Residue theorem – Arguments principle – Rouche's theorem – Contour Integration.

Text Book:
    Arumugam.S, Thangapandi Issac.A, Somasundaram. A, Complex Analysis, SCITECH publications private limited, 2007.
        Unit 1: Chapter 1(sec 1.5 - 1.7) and Chapter 3(sec 3.1 - 3.4).
        Unit 2: Chapter 2
        Unit 3: Chapter 6
        Unit 4: Chapter 7(sec 7.1 - 7.3).
        Unit 5: Chapter 7 sec 7.4   Chapter 8: (sec 8.1, 8.2, 8.3(type 1 & type 2)).

Reference Books:
    1. Shanti Narayanan, Complex Analysis, S. Chand & Co, 1999.
    2. Duraipandian.P, Lakshmi Duraipandian and Muhilan.D, Complex Analysis, Emerald
    3. Publishers, 1994.
    4. Ponnuswamy.S, Foundations of Complex Analysis, Narosa Publishing House, 2004.
    5. Karunakaran.V , Complex Analysis, Narosa Publishing House, 2006.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5

K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3	3	
K4: Analysing					4
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 3616 **OPERATIONS RESEARCH - II** **6 Hrs/ 6 Cr**

This course helps the student to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type and to design new simple models, like CPM to improve decision-making and develop critical thinking and objective analysis of decision problems.

At the end of the course, students will be able to

   i.   demonstrate the use of simplex method in analyzing the sensitivity of the optimal solution interms of change in the cost vector/ requirement vector/coefficient matrix/addition or deletion of variable.
   ii. compute to optimize an I.P.P using Gomary's method
   iii. design new models imitating PERT/CPM, solve PERT/CPM, predict the probability of project completion time.
   iv. formulate different inventory models and identify formula to calculate different parameters.
   v.   develop different queuing models with suitable parameters and compute solutions.

Unit 1: Introduction to sensitivity Analysis – Changes in the cost vector, requirement vector – Coefficient matrix – Addition and deletion of variables - related problems.

Unit 2: Introduction to Integer programming – Gomary's all-IPP Method – construction of Gomary's cut – fractional cut method-all Integer and mixed Integer related problems.

Unit 3: Network Scheduling by PERT/CPM- Introduction – Network and Basic components – Rules of network construction – Time calculations in networks – Critical Path Method (CPM)- PERT:PERT calculations - Negative float and Negative slack – advantages of network (PERT/CPM).

Unit 4: Inventory Control- Introduction – Reasons for carrying inventory – Types of inventory – The inventory decisions – Economic Order Quantity- Four EOQ models – EOQ problem with price breaks- Multi item deterministic problem.

Unit 5: Queueing Theory- Introduction – Queueing system – Characteristics of Queueing Systems - Classification of Queueing models – Solution of Queueing models- $\{(M/M/1): (\infty/FIFO)\}$, $\{(M/M/1): (N/FIFO)\}$,$\{(M/M/C): (\infty/FIFO\}$,$\{(M/M/C): (C/FIFO)\}$.

Text book:

Kantiswarup, Gupta P.K. & Manmohan, Operations Research, Sultan Chand & Sons, 2004.

    Unit 1: Chapter 6 (sec 6.1 – 6.5 (except addition & deletion of a constraint)).
    Unit 2: Chapter 7(sec 7.1 – 7.5).
    Unit 3: Chapter 21
    Unit 4: Chapter 19 (sec 19.1-19.9).
    Unit 5: Chapter 20 (sec 20.1 – 20.8 (Model I, III, V, VII)).

Reference Books:

1. Hadley. G, Linear Programming, Narosa Book Distributors Private Ltd., 1963.
2. Taha, H.A. Operations Research – An Introduction (8th Edition) Prentice Hall of India, New Delhi, 2007.
3. Bronson R, Operations Research 2nd Edition, Schaum's Outline Series, 1997.
4. Sharma, J.K. Operations Research, Theory and applications, Macmillan, New Delhi, 2003.
5. Sundaresan.V, Ganesan. K, Resource management Techniques, AR publications, 2009.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3	3	
K4: Analysing					4
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 3512   **FUZZY MATHEMATICS**   **5Hrs / 5Cr**

Fuzzy mathematics forms a branch of mathematics related to fuzzy set theory and fuzzy logic. It started in 1965 after the publication of Lotfi Asker Zadeh's seminal work Fuzzy sets. The quest for imitating human brain (artificial intelligence) since the invention of computers has propelled this area of Mathematics to a large extend as the human brain does not see things in black and white but rather in rainbow colors.

At the end of the course, the students will be able to

    i. distinguish between the crisp set and fuzzy set and draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic functions of crisp sets and membership functions of fuzzy sets, respectively.
    ii. discuss properties of $\alpha - cuts$ and various representation of fuzzy sets.
    iii. extend the binary operations union, intersection, complementation of crisp sets to fuzzy sets.
    iv. outline the concept of fuzzy numbers and arithmetic operations, and to solve fuzzy equations.
    v. distinguish fuzzy relation from crisp relation and solve fuzzy relation equations.

Unit 1: Crisp sets and fuzzy sets– Basic concepts of fuzzy set – Classical and fuzzy logic.

Unit 2: α -cuts – Properties of α -cuts – Representations of fuzzy sets – Extension principle of fuzzy sets.

Unit 3: Operations on fuzzy sets – Fuzzy complements – Fuzzy union – Fuzzy intersection.

Unit 4: Fuzzy numbers – Arithmetic operation on intervals – Arithmetic operation on fuzzy numbers – fuzzy equations.

Unit 5: Crisp and fuzzy relations – Binary fuzzy relations – Binary relation on a single set – Equivalence and similarity relation – Fuzzy relation equation.

Text Books:
1. Klir.G.J and Folger T.A, Fuzzy sets Uncertainty and information, Prentice Hall of India, 1995.
   Unit 1: Section 1.1 – 1.6.
   Unit 3: Section 2.1 – 2.5.
   Unit 5: Section 3.1– 3.5 & 3.8.
2. Klir G.J and Bo Yuan, Fuzzy Sets, Fuzzy Logic, Theory and Applications, Prentice Hall of India, 1997.
   Unit 2: Sections 2.1 – 2.3.
   Unit 4: Section 4.1, 4.3, 4.4, 4.6(exclude Theorem 4.1, 4.2)

Reference Book:
H.J.Zimmermann, Fuzzy Set Theory and Its Applications, Kluwer Academic Publishers, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	3
K4: Analysing			4		
K5: Evaluating					
K6: Creating					

Mean= 3

MAT / MAS 1431   MATHS FOR PHYSICS- I5Hrs / 4Cr

This course develops among the students, the mathematical skills required to study physics. This course deals with vectors, solutions of linear equations, Eigen value, Eigen vectors, complex numbers, series expansion and complex integration.

At the end of the course, students will be able to
  i. compute the curl and the divergence of vector fields
  ii. evaluate line integrals, surface integrals and volume integral and use Stoke's theorem, Green's theorem, divergence theorem to illustrate the relation between any two of the above three.

iii. compute Eigen values using elementary transformation, compare and contrast the inter relationship between different coordinate systems
iv. apply Cauchy Riemann equation to identify analytic functions
v. compute complex integration and apply Cauchy theorem to characterize analytic functions. Compute the residues and use it for evaluation of the definite integrals.

Unit 1: Vector definition - dot product - cross product - unit normal vector -Vector differentiation results - vector differential operator definition – gradient - directional derivatives - divergent and curl - solenoidal and irrotational - scalar potential function - Formula involving operator ∇-operation involving ∇ twice related problems.

Unit 2: Line integral- surface integral- volume integral – verification of Divergence theorem due to Gauss- Green's theorem and Curl theorem due to Stokes – General & orthogonal curvilinear coordinates- Polar coordinates- Right circular cylindrical coordinates- Spherical coordinates.

Unit 3: Solution of a system of Linear equations: Homogeneous and non homogeneous problems using rank method-Eigen value problem- Coordinate transformations- Rotation in two dimensions- Rotation in three dimensions.

Unit 4: Introduction to complex numbers - Complex differentiation- Cauchy Riemann equations - Analytic functions - Harmonic equation - related problems.

Unit 5: Complex integration – Cauchy's theorem and Integral formula - Residues - m^{th} order pole- simple pole- Cauchy's residue theorem- Evaluation of definite integrals.

Text Books:
1. Manickavachagom Pillay T.K, Narayanan .S, Vector Algebra and Vector Analysis, S. Viswananthan pvt. Ltd, 1996.
>   **Unit 1:**Chapter IV (sec 1, 2(Results), 6, 7, 8 , 9.1,10,11,12).
>   **Unit 2:**   Chapter VI (sec 2 - 7 and 9) (sec 4 -7 and 9).

2. Arumugam. S. & Thangapandi Issac. A., Modern Algebra, Scitech pulications private   ltd,2003.
>   **Unit 3:** Chapter VII(sec 7.6, 7.8).

3. S. Arumugam & A. Thangapandi Issac, Complex Analysis, New Gamma publishing house, 2001.
>   **Unit 4:** Chapter II (sec 2.5,2.6,2.7,2.8).
>   **Unit 5:** Chapter VI (sec 6.1, 6.2, 8.1,8.2).

Reference Book:

1. Khanna. M.L, Matrices, Jai Prakash Nath& Co. Meerut, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering	1				
K2: Understanding					
K3: Applying			3	3	3

K4: Analysing					
K5: Evaluating		5			
K6: Creating					

Mean= 3

MAT1433 (ECE/ECO)   MATHEMATICS FOR ECONOMICS   5Hrs / 4Cr

The course deals with quadratic equation, matrices, differentiation, integration, and differential equations. This course introduces to the learner the quantitative techniques which can be applied in dealing with the study of economics.

At the end of the course, student will be able to:

   i.   identify and solve linear and quadratic equations, examine the nature of roots and the relations between roots and coefficients.
   ii.   apply matrix operations to solve simultaneous equations.
   iii. discuss the concept of derivatives of a function and apply this to find maxima and minima.
   iv.   illustrate the concepts of integration and find area between curves.
   v.   demonstrate and solve first and second order differential equations.

Unit 1: Importance of quantitative analysis – functions; linear, quadratic, nature of roots – relations between roots and coefficients – Theory of indices – index rules.

Unit 2: Matrices – types of matrices - determinants – inverse of matrix – solving system of equations using Crammer's rule.

Unit 3: Differentiation: successive differentiation – maxima & minima – partial Differention - total differentiation.

Unit 4: Integration: standard forms – rules and definite integrals – area between two curves.

Unit 5: Differential equations – solving first order and second order differential equations.

Text Books:
   1. Mehta. B.C. & Madnani. G.M.K, Mathematics for Economists, Sultan Chand & Sons, Nineth edition, 2008.
      Unit 1: Sections 1.16-1.17.
      Unit 2: Sections 5.1-5.12; 5.13(II), 5.15.
      Unit 3: Sections 6.1-6.5; 6.8-6.9; 8.1-8.4; 8.7-8.8.
      Unit 4: Chapter 12 & sections 13.1-13.3.
      Unit 5: Sections 14.1-14.7; 14.10-14.12.

   2. Aggarwal R.S, Quantitative Aptitude, S. Chand & company Ltd., Revised Edition 2008.
      Unit 1: Chapter 9

Reference Books:
   1. M.JeyaramArumugam, Mathematics – an introduction, 1985
   2. M.L. Khanna, Matrices, Jai Prakash Nath& Co. Meerut, 2001.
   3. Madha and Madnani, Mathematical applications in Economics, Himalaya, 2000.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2			2	2
K3: Applying		3			
K4: Analysing					
K5: Evaluating					
K6: Creating			6		

Mean= 3

MAT / MAS 1432   MATHS FOR PHYSICS- II   5Hrs / 4Cr

This course develops among the students, the mathematical skills required to study physics.

At the end of the course, students will be able to

  i. distinguish between linear, nonlinear, partial and ordinary differential equations and solve homogeneous, non homogeneous, linear and exact differential equations
  ii. solve second order differential equation with constant, variable and polynomial coefficients
  iii. classify and solve the partial differential equations of standard types
  iv. explain the relationship between Fourier series and linear time-invariant system
  v. formulate recurrence relations for Legendre and Hermite differential equations

Unit 1: Differential equations- Order and degree – Variable separable- First order linear homogeneous equations – Non homogeneous differential equations - linear differential equation – Bernoulli's equation and exact differential equations.

Unit 2: Second order differential equations – Second order differential equation with constant coefficients-Second order differential equations with variable coefficients and polynomial coefficients.

Unit 3: Partial differential equations – Lagrange's method – Standard types - Equations solvable for p and q - Equations solvable for x, y and z - Equation of the form $f_1(x, p) = f_2(y, q)$ – Clairant's form – Equations reducible to standard forms – Charpit's method.

Unit 4: Fourier series – Step functions – odd and even functions- Fourier integral and its complex form - Half – range series: cosine and sine series - Properties of Fourier series - Parseval's relation.

Unit 5: Introduction to Hermite and Legendre polynomials – Basic equations – Solution to Hermite differential equation and Legendre differential equation – Generating function – Rodrigues formula – Ortho normality relations – Recurrence relation and problems.

Text Books:

1. Manickavachagom Pillay.T.K, Narayanan.S, Differential equations and its applications, S.Viswananthan pvt. Ltd, 2013.
   Unit 1: Chapter I and Chapter II (Up to 6.3)
   Unit 2: Chapter V (Up to Exercise XVI)
   Unit 3: Chapter XII (Up to Exercise XXXIX).
2. Durai pandian. P & Udhayabaskaran. S, Allied Mathematics volume II, S. Chand & company Pvt. Ltd, 2016.
   Unit 4: Chapter IV
3. Saran, Sharma and Trivedi , Special functions, Pragati Prakashan Publications,2003.
   Unit 5: Chapter 7(sect 7.1,7.2) and
   Chapter 6(sec 6.1, 6.2 (recurrence relation only)).

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering				1	
K2: Understanding					
K3: Applying					
K4: Analysing	4		4		
K5: Evaluating					
K6: Creating		6			6

Mean= 4.2

MAT 1334 (ECE/ECO) FUNDAMENTALS OF COMPUTER APPLICATIONS   3Hrs / 3Cr

To create awareness on the efficiency and accuracy in using computer techniques in dealing with problems in social sciences with special emphasis on study of economic, To introduce the basic tools in computer software.

At the end of the course, students will be able to

   i.   identify the physical components of computer.
   ii. create, Edit and format documents, print the letters using mail merge in Microsoft Word.
   iii. construct formulas, including the use of built-in functions, create charts using Microsoft Excel.
   iv. design a presentation using Microsoft Power point.
   v.   use internet applications and explain various features of multimedia.

Unit 1: Physical components of computer – input – output devices – hardware and software – operating system.

Unit 2: Word – creating a document – editing – move and copy text – help system – formatting text and paragraph – finding and replacing text – spelling checking – tabs – enhancing document – column and tables – graphs – mail merge.

Unit 3: Data Base Management – spread sheet – MS Excel – basic commands – word processing – inserting and deleting rows and columns – formatting and printing work sheet – creating a chart – date and time – naming ranges and using statistical data.

Unit 4: Power-point – creating a presentation – power-point view, running a slide show – printing a presentation.

Unit 5: Office automation – multimedia application – internet browsing

Text Book:

Taxali. R.K., PC Software for windows – Made simple, Tata Mc Graw- Hill, 1998.

Unit 1: Fundamentals of Computer Studies, Expert Solution Consults, 2010.
Unit 2: Chapters 8-18, Microsoft office word 2007, Torben Lage Frandsen, e – publication.
Unit 3: Chapters 19-27,Microsoft office Excel 2007, Torben Lage Frandsen, e – publication
Unit 4: Annexure B , Microsoft office power point 2007, Torben Lage Frandsen, e-publication.
Unit 5: Fundamentals of Computer Studies, Expert Solution Consults, 2010.

Reference Book:
Alan R. Neibaner, Microsoft word for windows, Made easy, The basics and beyond, Tata Mc Graw Hill, New Delhi, 1999.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3				3
K4: Analysing					
K5: Evaluating					
K6: Creating		6	6	6	

Mean= 4.8

MAT 1104   FUNDAMENTALS OF COMPUTER APPLICATIONS-LAB 2Hrs / 1Cr

The main objective of the course is to enable the student to acquire the knowledge of Microsoft Office and internet browsing.

At the end of the course, students will be able to

  i.   work confidently with a computer as he gets hands on experience in an academic ambiance.
  ii. demonstrate the ability towards data entry in MS-word.
  iii. create a bio-data using Ms-|word
  iv. create a sheet and insert different charts
  v.   create a power point slide show with auto animation effects.

  1. Create a bio-data using Ms- word at least 2 pages.

2. Create a mail merge letter for your 5 friends
3. Insert the table with 5 columns and 8 rows and enter your mark details in the needed format.
4. Using Track Changes, Edit your document for Insert, Delete and Modify.
5. Open your saved document and check the spelling and grammar.
6. Create a Sheet with 15 sales person details and monthly Sales by person wise and total.
7. Insert the different type charts for your monthly wise sales amount.
8. Create pivot table and pivot chart from Area wise, Month wise, Person wise, Sales Amount.
9. Insert data from Text File and delete row/column and insert new row/column.
10. Create 5 Slide power point about healthy fruits.
11. Create a power point slide show with auto animation effects.
12. Create a power point auto slide show with duration and sound effects
13. Insert your favorite pictures with word art heading.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying		3			
K4: Analysing					
K5: Evaluating					
K6: Creating			6	6	6

Mean= 4.6

MAT 2431   **MATHS FOR CHEMISTRY - I**   **5Hrs /4Cr**

Mathematics will allow the students to develop a sophisticated understanding of mathematical structures and principles while gaining a wide range of skills that are attractive to employers. This course deals with matrices, eigen values, eigen vectors, sets, functions, groups, rings, fields, sampling, and numerical methods.

At the end of the course, students will be able to

i.   identify the different types of matrices and associated operations
ii. solve system of homogeneous/ non homogeneous equations. Apply Cayley Hamilton theorem to find inverse of a matrix.
iii. illustrate the concepts of sets, relations, functions, groups, rings and fields.
iv. identify and apply large and small sample tests.

v.   apply numerical techniques to find roots of algebraic/ transcendental equations and evaluate numerical differentiation and integration.

Unit 1: Matrices – elementary transformations – diagonalization – inverse – rank.

Unit 2: Solving homogeneous and non-homogeneous equations – Cayley-Hamilton theorem - Eigen values and Eigen vectors.

Unit 3: Sets – relations – functions – types of functions – groups – examples and simple problems, rings & fields with examples.

Unit 4: Sampling theory – Large and small sample tests for mean – normal, t-test, chi-square test.

Unit 5: Numerical methods – solution of algebraic equations – Interpolation - Newton's and Lagrange's methods – Numerical differentiation &integration.

Text Books:
1. Arumugam. S & Thangapandian Issac. A., Modern Algebra, SCITECH Publications, 1998
   Unit 1: Chapter 7(sec 7.1, 7.2, 7.4, 7.5)
   Unit 2: Chapter 7(sec 7.6-7.8)
   Unit 3: Chapter 1(sec 1.1-1.8), Chapter 2(sec 2.1, 2.2, 2.4), Chapter 3(sec 3.1), Chapter 4(sec4.1)
2. Arumugam S. & ThangapandianIssac.A, Statistics, New gamma publishing house, 2011.
   Unit 4: Chapter 14(sec 14.1-14.5 II A, B), Chapter 15(sec 15.1), Chapter 16(sec 16.1)
3. S. S.Sastry, Introductory methods of Numerical Analysis, 3rd edition, Prentice Hall of India Pvt.ltd., 2003.
   Unit 5: Chapter 2(sec.2.1-2.5), Chapter 3(sec 3.1, 3.3.1, 3.3.2, 3.6, 3.9.1), Chapter 5(sec 5.2, 5.4.1-5.4.3)

Reference Books:
1. Khanna M.L., Matrices, Jai Prakash Nath & Co. Meerut, 2001.
2. Gupta S.C. &. Kapoor V.K., Elements of Mathematical Statistics S.Chand, 1995.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding			2		
K3: Applying	3			3	3
K4: Analysing					
K5: Evaluating					
K6: Creating		6			

Mean= 3.4

MAT / MAS 2433   BUSINESS STATISTICS (COM / CME)   5Hrs / 4Cr

This course deals with measures of central tendency, correlation, regression, probability theory, and sampling theory.

At the end of the course, students will be able to

i. demonstrate and compute measures of central tendency and measures of dispersion
ii. compute correlation and regression for bivariate data.
iii. compute probability using addition and multiplication theorem and Baye's theorem.
iv. identify and apply sampling techniques to test hypothesis
v. evaluate and analyse the variance for one-way, multi-way classifications

Unit 1: Measures of central tendency – measures of dispersion.

Unit 2: Correlation – Correlation coefficients – Rank correlation – Regression – Regression coefficients.

Unit 3: Probability function – Addition and multiplication theorems on probability – Conditional probability – Baye's formula and theorem.

Unit 4: Types of sampling- parameters & statistic – statistical hypothesis – null and alternative hypothesis – types of errors- large samples based on normal area table – test of significance of small samples – t-test and F-test and Chi-square test for population variance and goodness of fit.

Unit 5: Analysis of variance – One way and two way classification – Latin square design.

Text Book:
Arumugam. S & Thangapandian Issac.A, Statistics, New Gamma publishing House, 2013.
  Unit 1: Chapters 2(except deciles& percentiles) & 3
  Unit 2: Chapter 6
  Unit 3: Chapter 11
  Unit 4: Chapters 14(sec14.1- 14.5(I& II)), 15 & 16(sec 16.1&16.2)
  Unit 5: Chapter 17

Reference Books:
1. Gupta .S.C and Kapoor .V. K, Mathematical Statistics, Sultan Chand and Sons, 2001.
2. Manmohan Gupta, Statistics, Sultan Chand and Sons, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3	3	3	
K4: Analysing					
K5: Evaluating					5
K6: Creating					

Mean= 3.2

MAT 2432   **MATHS FOR CHEMISTRY - II**   **5Hrs / 4Cr**

Mathematics will allow the students to develop a sophisticated understanding of mathematical structures and principles while gaining a wide range of skills that are attractive to employers. To reinforce and enhance the mathematical tools introduced earlier. Differential equation as a mathematical model for solving problems in chemistry is the central theme of the course. This course deals with differentiation, integration, differential equations and Laplace transform.

At the end of the course, students will be able to

   i.   apply the concept of differentiation of functions
   ii. identify and apply partial differentiation to determine the maxima and minima of functions of two variables.
   iii. evaluate definite and indefinite integrals
   iv. formulate and solve the first and second order differential equations
   v.   use Laplace transform techniques to solve differential equations

Unit 1: Differentiation – successive differentiation – meaning of derivative- maxima and minima.

Unit 2: Partial differentiation – errors and approximation- maxima and minima.

Unit 3: Integration – Methods of integration – Some standard formulae-Integration by parts – definite integral – reduction formula.

Unit 4: Formation of differential equations –growth, decay and chemical reactions- Solving first and second order differential equations.

Unit 5: Laplace transforms – Inverse transforms-solving linear differential equations.

Text Books:
   1. Narayanan. S. & Manickavachagom Pillay T.K., Calculus Vol.I, S. Viswanathan private limited, 2013.
      Unit 1: Chapter II (sec 2.1- 2.7, 3.1-3.3, 3.4, 3.6, 3.8),
                Chapter III (sec 1.1- 1.6, 2.1),
       Chapter IV (sec 2.1, 2, 2, 3, 4), Chapter V (sec 1.1- 1.5)
      Unit 2: Chapter VIII (sec 1.1-1.3, 1.5-1.7, 2.1, 2.3, 4, 5)
   2. Narayanan. S. & Manickavachagom Pillay. T.K., Calculus Vol. II, S. Viswanathan private limited, 2013.
      Unit 3: Chapter I(sec 1.1-6.4, 7.3, 7.4, 11, 12, 13.1-13.5(formula only), 15.1)
   3. Narayanan. S. & Manickavachagom Pillay. T.K., Differential Equations and its applications, S. Viswanathan private limited, 2008.

      Unit 4: Chapter I (sec 1, 3), Chapter II (sec 1, 2, 4, 6.1-6.4), Chapter III (sec 1)
                Chapter V (sec 1-4).
      Unit 5: Chapter XI (sec 1, 2, 4-9)

Reference Books:
   1. Hirst. D. N., Mathematics for Chemistry, Macmillan Press Ltd, 1993.
   2. Sankaranarayanan & Mangaladoss. J.A., Differential Equations and its Applications, Suja Publishing House, Palayamkottai (1980).

Bloom's Taxonomy	Unit 1 CO1	Unit 2 CO2	Unit 3 CO3	Unit 4 CO4	Unit 5 CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3	3			3
K4: Analysing					
K5: Evaluating			5		
K6: Creating				6	

Mean= 4

MAT / MAS 2434   BUSINESS MATHEMATICS (COM/CME)   5Hrs / 4Cr

This course is to introduce various concepts of mathematics required for commerce and it deals with differentiation, integration, matrices, transportation and assignment problem.

At the end of the course, students will be able to

i.   realize the concept of derivatives of a functions and determine the maxima and minima of a function.
ii. describe the concept of integration and distinguish/ solve definite and indefinite integrals and applying these concepts in real life situations.
iii. identify and apply matrix operations to solve simultaneous equations.
iv. compute the optimum solutions of Transportation and Assignment problems.
v.   assess the best strategy in game theory using dominance rule and graphical method for both pure and mixed strategies.

Unit 1: Differential calculus: idea of limit- continuity- average concept and marginal concept- differential coefficient- standard forms rules for differentiation- higher order derivatives – increasing and decreasing functions- criteria for maxima and minima applications.

Unit 2: Integral calculus: standard forms rules for integration- definite integral- integration by substitution – integration by parts- applications.

Unit 3: Matrices – types of matrix – consistency of a matrix – rank of matrix-solving system of Homogeneous and non- homogeneous equation.

Unit 4: Transportation problems: methods of finding IBFS-u-v method-unbalanced problems – Assignment problems.

Unit 5: Game theory– pure and mixed strategies –solution of 2x2 games- dominance rule-graphical solution of 2 X n and m X 2 games.

Text Books:
1. Sundaresan.V and Jeyaseelan.S.D, An introduction to Business Mathematics, S. Chand & co., 2003.
    Unit 1: Chapter (sec 3.1 - 3.10, 3.11(from pg118), 4.3)
    Unit 2: Chapter (sec 6.1 - 6.10, 6.11, 6.11.b, 6.11.c, 6.11.e)
    Unit 3: Chapter (sec 8.1 - 8.6, 8.8, 8.9)
2. Sundaresan. V, Ganapathy sub. K.S &Ganesan.K, Resource Management Techniques, A.R Publications, 2011.

Unit 4: Chapter 7.1 - 7.4, 8.1 - 8.5, 8.7, 8.9.
Unit 5: Chapter 16.1-16.4, 16.6, 16.7.

Reference Books:

1. Jeyaram&Arumugam,Mathematics an Introduction, New Gamma publishing House,1986. Khanna .M.L, Matrices, Jai Prakash Nath& Co. Meerut, 2001.
2. Narayanan .S & Manickavachagom Pillay .T.K,   Calculus, volume I & II, S.Viswanathan
3. private limited, 2002.
4. Arumugam .S &ThangapandianIssac. A , Differential equations with Applications, New
5. Gamma publishing house, 2008.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2	2			
K3: Applying			3	3	
K4: Analysing					
K5: Evaluating					5
K6: Creating					

Mean= 3

MAS 1433   DISCRETE MATHEMATICS (BCA)   5Hrs / 4Cr

The objective of this course is to inculcate the essential mathematical concepts for computer applications and improving their logical thinking as well as to equip the students to understand the concepts on algebraic structures, graph theory with examples.

At the end of the course, students will be able to

   i.   demonstrate the basic principles of sets, relations, functions and matrices with examples. Also solve simultaneous linear equation using Crammer's rule.
   ii. write an argument using logical notation and determine if the argument is valid or not.
   iii. acquire the knowledge of algebraic structures and emphasis on linear transformations.
   iv. outline the basic tools in counting principles in combinatorial structures.
   v.   demonstrate different types of graphs and their properties which may be explored through algorithms.

Unit 1: Set – Subset - Cardinality of a set- Cartesian product – Relations – Functions –Matrix - Inverse of a matrix - Solving system of equations using Crammer's rule.

Unit 2: Logic - Connectives- Well formed formula- Implications- Tautology- Valid conclusions.

Unit 3: Algebraic Structure - Semi group – Monoid – Group - Abelian group - Cyclic group

– Sub group - Ring - Sub ring – Vector space - Linearly independent sets - Linearly dependent sets – Basis - Linear Transformations.

Unit 4: Combinatorics - Addition and multiplication Principle – Permutations – Combinations – Recurrence relations.

Unit 5: Graph - Sub graphs – Walk – Trail – Path – Connected – Cycle - Euler graph - Fleury's Algorithm - Hamiltonian graph - Closure of a graph - Cut vertex - Cut edge – Tree – Kruskal's and Prim's algorithms.

Text books:
1. Dr. Venkataraman. M.K, Dr. Sridharan.M., Chandrasekaran.M, Discrete Mathematics, National Publishing Company, 2003
   Unit 1: Chapter 1(sec 1 - 4, 6, 9), Chapter 2(sec 1-5), Chapter 3(sec 1, 2, 5).
   Unit 2: Chapter 9 (sec 1 - 3, 5 - 8).

2. Arumugam. S & Thangapandian Issac. A, Modern Algebra, Scitech Publications, 2001.
   Unit 3: Chapter 3(sec 3.1, 3.5, 3.6) , Chapter 4(sec 4.1, 4.6),
   Chapter 5: sec 5.0, 5.1, 5.3-5.6

3. Alan Tucker, Applied Combinatorics, 5th edition, John Wiley & sons. Inc. 2007.
   Unit 4: Chapter 5(sec 5. 1, 5.2) Chapter 7(sec 7.1**).**

4. John Clark and Derek Allan Holton, A First Look at Graph Theory, Allied Publishers ltd, 1995.
   Unit 5: Chapter 1(sec 1.1, 1.3 - 1.6), Chapter 2(sec 2.2, 2.3, 2.6),
   Chapter 3(sec 3.1, 3)

Reference Books:
1. Shankerrao.G, Mathematical Foundations of computer science, I.K International publishing house pvt ltd, 2006.
2. Tremblay J.P & Manohar R, Discrete Mathematical Structures with applications computer science, Tata McGraw Hill, 1987.
3. Narsingh Deo, Graph Theory with applications to engineering and computer science, Prentice Hall India, New Delhi, 1989.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2			2	2
K3: Applying					
K4: Analysing			4		
K5: Evaluating					
K6: Creating		6			

Mean= 3.2

MAS 1435   **MATHS FOR CHEMISTRY - I**   **5Hrs / 4Cr**

Mathematics will allow the students to develop a sophisticated understanding of Mathematical structures and principles while gaining a wide range of skills that are attractive to employers. This course deals with matrices, Eigen values, Eigen vectors, sets, functions, groups, rings, fields, sampling, and numerical methods.

At the end of the course, students will be able to

i.   identify the different types of matrices and associated operations
ii.   solve system of homogeneous/ non homogeneous equations. Apply Cayley Hamilton theorem to find inverse of a matrix.
iii. illustrate the concepts of sets, relations, functions, groups, rings and fields.
iv.   identify and apply large and small sample tests.
v.   apply numerical techniques to find roots of algebraic/ transcendental equations and evaluate numerical differentiation and integration.

Unit 1: Matrices – elementary transformations – diagonalization – inverse – rank.

Unit 2: Solving homogeneous and non-homogeneous equations – Cayley-Hamilton theorem – Eigen values and Eigen vectors.

Unit 3: Sets – relations – functions – types of functions – groups – examples and simple problems, rings & fields with examples.

Unit 4: Sampling theory – Large and small sample tests for mean – normal, t-test, chi-square test.

Unit 5: Numerical methods – solution of algebraic equations – Interpolation -Newton's and Lagrange's methods – Numerical differentiation & integration.

Text Books:
1. Arumugam. S & Thangapandian Issac. A., Modern Algebra, SCITECH Publications, 1998
   Unit 1: Chapter 7(sec 7.1, 7.2, 7.4, 7.5)
   Unit 2: Chapter 7(sec 7.6 -7.8)
   Unit 3: Chapter 1(sec 1.1-1.8), Chapter 2(sec 2.1, 2.2, 2.4), Chapter 3(sec 3.1), Chapter 4(sec4.1)
2. Arumugam S. & ThangapandianIssac. A, Statistics, New gamma publishing house, 2011.
   Unit 4: Chapter 14(sec 14.1-14.5 II A, B), Chapter 15(sec 15.1)   ,
   Chapter 16(sec 16.1)

3. S. S.Sastry, Introductory methods of Numerical Analysis, 3rd edition, Prentice Hall of India Pvt.ltd., 2003.
   Unit 5: Chapter 2(sec.2.1-2.5), Chapter 3(sec 3.1, 3.3.1, 3.3.2, 3.6, 3.9.1), Chapter 5(sec 5.2, 5.4.1-5.4.3)

Reference Books:
1. Khanna M.L., Matrices, Jai Prakash Nath & Co. Meerut, 2001.
2. Gupta S.C. &. Kapoor V.K., Elements of Mathematical Statistics S.Chand, 1995.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding			2		
K3: Applying	3			3	3
K4: Analysing					
K5: Evaluating					
K6: Creating		6			

Mean = 3.4

MAS 1439   BUSINESS STATISTICS (CPA)   5Hrs / 4Cr

The objective of this course is to impart basic knowledge about application of statistics to various business situations.

At the end of the course, students will able to

  i.   demonstrate theoretical, graphical and diagrammatic representation of statistical data.
 ii.   analyze statistical data using measures of central tendency and measures of dispersion.
iii.   interpret and calculate the correlation and regression between two variables.
 iv.   analyze various index numbers and formulate the procedure to measure the change in the variable over the period of time.
  v.   measure the trend or variation existing in a time series data and demonstrate the basic concepts of probability

Unit 1: Introduction –Methods of Collecting Primary and Secondary Data- Sampling Methods - Classification and Tabulation – Formation of Discrete and Continuous Frequency Distribution – Graphical representation of Frequency Distribution – Diagrammatic presentation of Data.

Unit 2: Measures of Central Tendency – Arithmetic Mean – Simple and Weighted Arithmetic Mean – Combined Arithmetic Mean – Geometric Mean – Harmonic Mean – Median – Quartiles, Deciles and Percentiles – Mode – Measures of Dispersion – Range – Quartile Deviation - Standard Deviation – Combined Standard Deviation - Coefficient of Variation.

Unit 3: Correlation - Meaning – Significance – Types – Graphic method– Mathematical method- Karl Persons Co-efficient of Correlation - Rank Correlation- Concurrent Deviation- Lag and Lead in correlation- Regression- Meaning – Uses – Simple Regression Lines.

Unit 4: Index Numbers - Definition – Uses – Construction of Index Number – Methods– Laspeyre, Paasche, Bowley and Fisher's Ideal Index Number – Tests of Index number – Cost of living Index Number.

Unit 5: Analysis of Time Series - Meaning – Utilities – Components – Measurements of Trend – Method of Moving Averages – Method of Least Square – Measurement of Seasonal Variation- Probability – Addition, Multiplication Theorem – Conditional probability – Bayes' Theorem- Mathematical Expectations (Simple Problems Only).

Text Book :

R.S.N . Pillai and Bagavathi **,** Statistics theory and practice,S. Chand & sons, New Delhi,2017.

Unit 1: Chapters 1, 4, 5, 7, 8
Unit 2: Chapters 9, 10
Unit 3: Chapters 12, 13.
Unit 4: Chapter 14
Unit 5: Chapters 15, 18.

Reference Books :

1. Sanchetti & Kapoor, Statistics, Sulthan Chand, New Delhi, 2013.
2. Gupta .S.P, Statistical Methods , Sultan Chand & Sons, New Delhi, 2012.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	2				
K3: Applying					
K4: Analysing		4		4	
K5: Evaluating					5
K6: Creating			6		

Mean= 4.2

MAS 1434   **DISCRETE MATHEMATICS (COS)**   **5Hrs / 4Cr**

The objective of this course is to train the students with fundamental concepts of mathematics and to equip the students with logical thinking and analytical skills .This course deals with sets, logic, combinatorics and automata.

At the end of the course, students will be able to

i.   write an argument using logical notation and determine if the argument is valid or not
ii.   demonstrate the basic principles of sets, relations and functions with examples. Also outline basic concepts of Boolean algebra and lattices
iii. outline the basic tools in counting principles in combinatorial structures.
iv.   acquire the knowledge of algebraic structures and apply Lagrange's theorem to solve problems.
v.   demonstrate theories, concepts and techniques in automata and their link to computations.

Unit 1: Logic: Connectives-Normal forms-Inference theory of calculus- Inference theory of predicate calculus.

Unit 2: Set theory: Sets-Operations of sets- Relations- Functions- Boolean algebra- Lattices.

Unit 3: Combinatorics: Permutations- Combinations- Recurrence Relations - Generating Functions - Principle of inclusion and exclusion - Problems.

Unit 4: Algebraic Structure: Groups - Semi Groups- Monoids – Subgroups - Normal Subgroups - Lagrange's Theorem- Introduction to rings. (Definition and simple problems only).

Unit 5: Automata: Alphabets – Strings – Languages – Grammar - Type 0, Type1, Type2 and Type3 Grammars - Finite automata - Regular expressions - Non- deterministic finite automata.

Text Books:
1. Tremblay. J.P & Manohar.R, Discrete Mathematical Structures with applications of Computer Science, Tata McGraw- Hill 1987.
    Unit 1: Chapter 1(sec 1-2 - 1-2.4 ,1-2.6, 1-2.8 , 1-2.9 , 1-2.11 ,1-3.1- 1-3.4 ,1-4.2 & 1-6.4)
2. Tucker .A, Applied Combinatorics, John Wiley and sons, 2005.
    Unit 3: Chapter 5(sec 5.1- 5.4); Chapter 6(sec 6.1, 6.2)
        Chapter 7 (sec 7.1) .
3. S.Arumugam and A. Thangapandian Isaac, Modern Algebra, SCITECH publications, 2006.
    Unit 2: Chapter 9 (sec 9.1, 9.2, 9.3 and 9.5)
    Unit 4: Chapter 3(sec 3.1, 3.2, 3.5, 3. 8, 3. 9)

4. Dr.Venkataraman.M.K,Dr.Sridharan.N,Chandrasekaran.N,Discrete   Mathematics ,Then National Publication Company.
    Unit 2: Chapter 1 (All sections except sec 9 only problems) &
        Chapter 2 (sec 1, 2, 5)
    Unit 4: Chapter 7 (sec 3)
        Unit 5: Chapter 12(sec 3 -7 and 17)

References Books:
1. Schaums outline Series, Set Theory and Logic, Tata McGraw Hill, 1999.
2. Schaums outline Series, Boolean Algebra and switching circuits, Tata McGraw Hill, 1999.
3. Schaums outline Series, Discrete Mathematics, Tata McGraw Hill, 1999.
4. Schaums outline Series, Combinatorics, Tata McGraw Hill, 1999
5. J.E. Hopcroft, J.D.Ullman, Introduction to automata theory, Language and computations, Narosa publishing House, 1999.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding		2			2
K3: Applying			3		
K4: Analysing	4			4	
K5: Evaluating					

K6: Creating					

Mean= 3

MAS 1436　　　　　**MATHS FOR CHEMISTRY - II**　　　　　**5Hrs / 4Cr**

Mathematics will allow the students to develop a sophisticated understanding of mathematical structures and principles while gaining a wide range of skills that are attractive to employers.To reinforce and enhance the mathematical tools introduced earlier. Differential equation as a mathematical model for solving problems in chemistry is the central theme of the course. This course deals with differentiation, integration, differential equations and Laplace transform.

At the end of the course, students will be able to

  i.　apply the concept of differentiation of functions
 ii.　identify and apply partial differentiation to determine the maxima and minima of functions of two variables.
iii.　evaluate definite and indefinite integrals
 iv.　formulate and solve the first and second order differential equations
  v.　use Laplace transform techniques to solve differential equations

Unit 1: Differentiation – successive differentiation – meaning of derivative- maxima and minima.

Unit 2: Partial differentiation – errors and approximation- maxima and minima.

Unit 3: Integration – Methods of integration – Some standard formulae-Integration by parts – definite integral – reduction formula.

Unit 4: Formation of differential equations –growth, decay and chemical reactions- Solving first and second order differential equations.

Unit 5: Laplace transforms – Inverse transforms-solving linear differential equations.

Text Books:
   1. Narayanan. S.& Manickavachagom Pillay T.K., Calculus Vol.I, S. Viswanathan private limited, 2013.
　　　　　Unit 1: Chapter II (sec 2.1- 2.7, 3.1-3.3, 3.4, 3.6, 3.8),
　　　Chapter III (sec 1.1- 1.6, 2.1),
　　　 Chapter IV (sec 2.1, 2, 2, 3, 4), Chapter V (sec 1.1- 1.5)
　　　　　Unit 2: Chapter VIII (sec 1.1-1.3, 1.5-1.7, 2.1, 2.3, 4, 5)
   2. Narayanan. S. & Manickavachagom Pillay. T.K., Calculus Vol. II, S. Viswanathan private limited, 2013.
　　　　　Unit 3: Chapter I (sec 1.1-6.4, 7.3, 7.4, 11, 12, 13.1-13.5(formula only), 15.1)
   3. Narayanan.S. & Manickvachagom Pillay. T.K., Differential Equations and its applications, S. Viswanathan private limited, 2008.
　　　Unit 4: Chapter I (sec 1, 3), Chapter II (sec 1, 2, 4, 6.1- 6.4),
　　　Chapter III (sec 1) ,Chapter V (sec 1 - 4).
　　　　　Unit 5: Chapter XI (sec 1, 2, 4 - 9)

Reference Books:

1. Hirst. D. N., Mathematics for Chemistry, Macmillan Press Ltd, 1993.
2. Sankaranarayanan & Mangaladoss. J.A., Differential Equations and its Applications, Suja Publishing House, Palayamkottai (1980).

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying	3	3			
K4: Analysing					4
K5: Evaluating			5		
K6: Creating				6	

Mean= 4.2

MAS 1438   **STATISTICS (BIT)**   **5Hrs / 4Cr**

The aim of this course is to enable the students to understand statistics. This course essentially deals with the probability distribution theory which is the basis of statistics and it covers the topics which include correlation, regression and analysis of variance.

At the end of the course, the students will be able to

    i.   analyze statistical data using measures of central tendency/dispersion .
    ii.   calculate and interpret the correlation/regression between two variables.
    iii.   apply the basic probability rules to solve problems.
    iv.   identify and solve the problems on sampling distribution.
    v.   analyse the variance of one/two way classification and design Latin square.

Unit 1: Measures of central tendency - Measures of dispersion

Unit 2: Correlation – Correlation coefficient – Rank correlation – Regression – Regression Coefficient

Unit 3: Probability function – Addition and multiplication theorems on probability- Conditional probability - Baye's formula and theorem

Unit 4: Types of sampling – Parameters and statistics –Statistical hypothesis – Null and alternative hypothesis – Types of errors –Large samples based on normal area table – Test of significance of small samples- t-test and F-test and chi square test for population variance and goodness of fit.

Unit 5: Analysis of variance – One way and two way of classification –Latin square design.

Text Book:

Arumugam.S & Thangapandian Issac .A, Statistics, New gamma publication House, 2013.

  Unit 1: Chapter 2(sec 2.0 - sec 2.4), Chapter 3 (sec 3.1)

Unit 2: Chapter 6(sec 6.1 - 6.4)
Unit 3: Chapter 11
Unit 4: Chapter 14(sec 14 .3 & 14.4), Chapter 15(sec 15.1 & 15. 2),
               Chapter 16 (sec 16.2)
Unit 5: Chapter 17(sec 17.2 to 17.3)

Reference Book:

Gupta .S.C. & Kapoor .V.K, Elements of Mathematical statistics, S.chand co, 1995.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying			3	3	
K4: Analysing	4				4
K5: Evaluating		5			
K6: Creating					

Mean =4.4

MAS 1440   **BUSINESS STATISTICS (BBA)**   **5Hrs / 4Cr**

This course is designed to acquire the skills needed for decision making under uncertainties using statistical tools.

At the end of the course, students will able to

   i. recognize the basic concepts of Statistics theoretically.
   ii. examine statistical survey, collection of data and various representations of data and analyze statistical data using measures of central tendency.
   iii. analyze statistical data using measures of dispersion.
   iv. calculate and interpret the correlation between two variables.
   v. apply regression analysis in business, analyze various index numbers and measure the trend existing in a time series data

Unit 1: Business statistics: Introduction - definition - nature and scope – objectives - importance - functions of statistics – limitations - uses of statistics in various fields.

Unit 2: Statistical survey - execution of survey - collection of data - sampling design - classification of data - tabulation - diagrammatic presentation - graphical presentation, measures of central tendency - arithmetic mean - combined mean – weighted means – median - quartile - percentile-mode - geometric mean - harmonic mean.

Unit 3: Measures of dispersion-range-quartile deviation-mean deviations-standard deviation-variance-coefficient of variation-combined standard deviation.

Unit 4: Skewness-correlation analysis-types of correlation-karl pearsons's coefficient of correlation-spearman's rank correlation-concurrent deviation-coefficient of determination.

Unit 5: Regression analysis-business applications of regression analysis-index number - uses-methods of calculation of index number – analysis of time series.

Text Books:
1. Dr. Selvaraj .V.M,   Business Statistics, Bhavani publications, 2011 (for theory).
      Unit 1: Chapter 1(sec1 – 8)
      Unit 2: Chapter 1(sec 1-9 - 1-32), Chapter 2
      Unit 4: Chapter 5(sec 5-1, 5-2), Chapter 6(sec 6-1 - 6-5, 6.7), Chapter 7
 (sec 7-1, 7-2)
2. Arumugam, Isaac, Statistics, New gamma Publishers, 2008 (for problems)
      Unit 2: Chapter 2
      Unit 3: Chapter 3
      Unit 4: Chapter 6.1 – 6.3
      Unit 5: Chapter 9.1, 9.2, Chapter 10

Reference Books:
1. Pillai.R.S.N. & Bhavathi.V, Business Statistics, S. Chand Publishers, 2015.
2. Gupta S.C, Kapoor.V.K, - Fundamentals of Mathematical Statistics, 10th-Edition, 2000.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying					3
K4: Analysing		4	4		
K5: Evaluating					
K6: Creating				6	

Mean= 3.8

MAS 1446   **BUSINESS MATHEMATICS (CPA)**   **5Hrs / 4Cr**

The objective of this course is to impart basic knowledge and application of business mathematics to commercial situations.

At the end of the course, students will be able to

i.   solve problems in objective arithmetic.
ii.   compile different rules governing counting principles and solve problems in permutation and combination.
iii. solve linear equations involving two variables and also quadratic equation.
iv.   compute the sum to n terms of an arithmetic/geometric progression and its relevance in the field of accounting.
v.   utilize the methods and principles in differential calculus to solve problems in business world.

Unit 1: Ratios and Proportions - Simple and Compound Interest Including Application of Annuity – Variation, Indices – Laws of indices - Fractional index - Operations with

power functions - Surds-Operations on surds - Rationalizing factor - Number Systems and Conversions.

Unit 2: Set – Types of sets - Venn Diagrams - Operation on sets - Number of elements in a finite set - Related problems - Permutation – Fundamental rule of counting – Permutation of n different things - Circular permutations - Permutation of things not all different - Restricted permutations – Combinations - Restricted combinations- Combination of things not all different .

Unit 3: Linear Simultaneous Equations - Quadratic Equations - Solution to quadratic Equations - Nature of the roots - Inequalities.

Unit 4: Sequence and Series- Summation of series - Arithmetic progression - Sum of series in A.P- Geometric Progressions – Sum of series in G.P- Arithmetic mean - Geometric mean.

Unit 5: Calculus – Function - Types of functions – Limit of a function - Continuity of a Function – Differentiation - Derivative function of one variable, Power function, Constant with any function, sum, product, quotient of two function - Function of a function - Logarithmic functions - Maxima and Minima – Partial differentiation.

Text Books:
1. Dr. Aggarwal.R.S, Objective Arithmetic, S.Chand publishing,New Delhi,2013.
    Unit 1: Chapter 12, 21& 22

2. Switching and finite automata theory, Z.Kohavi,Tata MCGraw hill publishing company,1978.
    Unit 1: Chapter

3. Sancheti.D.C., Kapoor.V.K, Business Mathematics Sultan Chand& Sons, New Delhi,2005.
    Unit 1: Chapter 6
    Unit 2: Chapter 2, Chapter 9
    Unit 3: Chapter 8 (sec 8.3, 8.7- 8.11)
    Unit 4: Chapter 11&12
    Unit 5: Chapter 17 (sec17.0-17.8, 17.10, 17.19 &17.20)

Reference Books:
1. Ranganath.C.K, Sampagiram.C.S. and Rajaram.Y, Business Mathematics, Himalaya Publishing House, Mumbai, 2011.
2. Gupta.S.C , Business Mathematics , Sultan Chand & sons, New Delhi, 2010.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying					3
K4: Analysing					
K5: Evaluating					
K6: Creating	6	6	6	6	

Mean= 5.4

MAS 2431   OPERATIONS RESEARCH (BIT)   5Hrs / 4Cr

The purpose of this course is to introducesome of the quantitative techniques which are essential for Information technology to the students.

At the end of the course, the students will be able to

   i.   formulate Linear Programming Problem (LPP) and predict solutions of LPP using graphical and simplex methods.

   ii. compute optimum solution of both balanced and unbalanced transportation problem.

   iii. identify the concept of assignment problem and its solutions.
   iv. compute best strategy in game theory using dominance and graphical method for both pure and mixed strategy.

   v.   design new models imitating PERT/CPM, solve PERT/CPM, predict the probability of project completion time.

Unit 1: Introduction to operations research - Linear programming problem (L.P.P) – Mathematical formulation – Graphical solution– Solution to L.P.P by simplex method.

Unit 2: Transportation problem – Mathematical formulation – Finding initial basic feasible solution – Northwest corner rule, least cost method and Vogel's approximation method – Moving towards optimality – Unbalanced transportation problem.

Unit 3: Assignment problem: Introduction – Mathematical formulation – Hungarian Assignment algorithm – variations of the Assignment problem.

Unit 4: Game theory – Introduction – Two person zero sum games – Maxmin principle - minimax principle – Saddle points – Games without saddle points – Solution of 2 x 2 games – Graphical method – Dominance property.

Unit 5: PERT/CPM – Introduction – Networking – Critical path analysis – Probability considerations in PERT.

Text Book:
   KantiSwarup, Gupta and Man Mohan, Operations Research, Sultan Chand and Sons 2004.
           Unit 1: Chapter 1 (sec 1. 1, 1.6 & 1.7); Chapter 2 (sec 2.1, 2.2);
                   Chapter 3 (sec 3.1, 3.2), Chapter 4 (sec 4.3)
           Unit 2: Chapter 10 (sec 10.1, 10.9, 10. 10, 10. 14)
           Unit 3: Chapter 11 (sec 11.1 - 11. 4)
           Unit 4: Chapter 17 (sec 17 .1 - 17.7)
           Unit 5: Chapter 21(sec 21. 1 - 21. 6)

Reference Books:
   1. Taha, H.A, Operations Research - An Introduction, Prentice Hall, 8th Edition, 2007.
   2. Kapoor V.K, Operations Research, Sultan chand and sons, 1997.
   3. Gupta P.K, and Man Mohan, Problems in Operations Research, Sultan chand and Sons, 2007.

4. Paneerselvam, Operations Research, Prentice Hall, 2004.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying					
K4: Analysing		4	4	4	
K5: Evaluating					
K6: Creating	6				6

Mean= 4.8

MAS 2437   **BUSINESS STATISTICS (CIT)**   **5Hrs / 4Cr**

The purpose of this course is to develop the numerical and analytical ability with statistical tools. This course equips the students with various statistical tools which can be used in business environment.

At the end of the course, students will be able to

i. demonstrate the fundamental concepts in data analysis and recognizes the importance of Statistics in various fields.
ii. analyze and interpret statistical data using measures of central tendency, quartiles and percentiles.
iii. recognize the importance of measuring dispersion and solve appropriate problems.
iv. calculate and interpret the correlation and regression between two variables.
v. demonstrate the different methods of computation of index numbers with examples.

Unit 1: Meaning - Scope - Importance and Limitations of Statistics - Statistically Investigation: Planning of Statistical Investigation - Census and collection of primary and secondary data - Statistical errors and approximation - Classification and Tabulation of data- Frequency distribution.

Unit 2: Statistical Average: Arithmetic - geometric and Harmonic means – Mode – Median – Quartiles and Percentiles - Simple and weighted averages - Uses and limitations of different averages.

Unit 3: Dispersion: Range - Quartile deviation - mean deviation and their coefficients – standard deviation- Coefficient of variation.

Unit 4: Correlation: Types of correlations - Karl person's coefficient of correlation – Spearman rank correlation – Regression – meaning – applications – equations.

Unit 5: Index Numbers: Utility of index numbers - Problems in the construction of index numbers - Simple and weighted index number - Fisher's ideal index number -Time reversal test - Factor reversal test - Commodity reversal test.

Text Books:
1. Dr. Selvaraj.V.M, Business Statistics, Bavani Puplications, 2011.
   Unit 1: Chapter 1

2. S. Arumugam, & A. Thangapandian Isaac, Statistics, New Gamma Publication House, 2004.

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Unit 2: Chapter 2(sec 2.1, 2.2 (except Deciles), 2.3, 2.4, 2.5)
Unit 3: Chapter 3(sec 3.1)
Unit 4: Chapter 6(sec 6.1, 6.2, 6.3, 6.4)
Unit 5: Chapter 9(sec I-A, I-B, II-A, II-B)

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Reference Books:
1. Gupta .S.P, Fundamentals of Statistics, Sultan Chand Publishers, New Delhi, 2007.
2. Elhance .D.N, Fundamentals of Statistics, New Century Book House, 2011.
3. Gupta .S.C, V. K. Kapoor, Mathematical Statistics, Sultan Chand & Sons 2001.
4. Gupta.S. P, Statistical Methods, Sultan Chand & Sons, 2001.
5. Dr. Vittal .P. R, Mathematical Statistics, MARGHAM Publications, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				2
K3: Applying					
K4: Analysing		4	4		
K5: Evaluating					
K6: Creating				6	

Mean= 3.6

BBA 2545   **QUANTITATIVE TECHNIQUES (BBA)**   **5Hrs / 4Cr**

This course aims to equip the students with the basic mathematical and quantitative techniques that would enhance their Decision making skills both as a manager and as an entrepreneur.

At the end of the course, students will be able to

i. demonstrate the concept of matrix algebra and recall the concepts of probability.
ii. formulate a problem into an Linear Programming Problem(LPP) and optimize using graphical and simplex method.

iii. compute the optimum solution of transportation problems.

iv. identify and evaluate assignment problems.

v. assess the best strategy in game theory using dominance rule and graphical method for both pure and mixed strategies.

Unit 1: Basic concepts in matrix algebra – Determinant - Solving linear equations using Crammer's rule, matrix inversion method – Introduction to theory of probability.

Unit 2: Concept of Linear Programming Problem: Formulation - Terminologies – Assumptions – Application and Limitations; LPP solution methods – Graphical method – Simplex method.

Unit 3: Transportation Problem: Mathematical formulation – Initial basic feasible solution methods: North West corner rule – Least cost method – Vogel's approximation method – Optimality checking – Stepping stone method.

Unit 4: Assignment problem: Introduction – Mathematical Formulation – Hungarian assignment algorithm – Variations of the assignment problem.

Unit 5: Game Theory: Introduction - Basic terminologies – Two person zero sum game – Games with saddle point – Games without saddle point mixed strategies – Dominance property of reducing the size of the game – solution methods.

Text Books:
1. Khanna M.L, Matrices, Jai Prakash Nath& Co. Meerut, 2001.
    Unit 1: Chapter
2. Arumugam. S, & Thangapandian Issac .A, Statistics, New Gamma Publication House, 2004.
    Unit 1: Chapter 11
3. Kantiswarup and Manmohan, Operations Research, Sultan Chand and sons, New Delhi, 2004.
    Unit 2: Chapter 2& Chapter 3 (sec 3.1, 3.3)
    Unit 3: Chapter 6 (sec 6.1, 6.2, 6.5, 6.6)
    Unit 4: Chapter 7
    Unit 5: Chapter 9 (sec 9.1-9.7)

Reference Books:
1. Sundaresan.V, Ganapathy Subramanian. K.S, Ganesan.K, Resource Management Techniques, A.R.Publications, 2002
2. Natarajan , Balasubramani, Tamilarasi, Operations Research , Pearson Education, 2007.
3. Ramnath , Rohitashwa**,** Quantitative Techniques for Managers, Himalaya Publications, 2010.
4. Paneerselvam, Operations Research, Prentice Hall, 2007.
5. Kothari, Introduction to Operation Research, Vikas publishing House, New Delhi, 2010.
6. Gupta. P.K, Man Mohan, Problems in Operation Research, Sultan Chand and sons, New Delhi, 2010.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying			3		
K4: Analysing				5	5
K5: Evaluating					
K6: Creating		6			

Mean= 4.2

MAS 2475   **BUSINESS STATISTICS (CMC)**   **5Hrs / 4Cr**

The purpose of this course is to develop the numerical and analytical ability with statistical tools. This course equips the students with various statistical tools which can be used in business environment.

At the end of the course, students will be able to

i.   demonstrate the fundamental concepts in data analysis and recognizes the importance of Statistics in various fields.
ii. analyze and interpret statistical data using measures of central tendency, quartiles and percentiles.
iii. recognize the importance of measuring dispersion and solve appropriate problems.
iv. calculate and interpret the correlation and regression between two variables.
v.   demonstrate the different methods of computation of index numbers with examples.

Unit 1: Meaning – Scope - Importance and Limitations of Statistics - Statistically Investigation: Planning of Statistical Investigation - Census and collection of primary and secondary data - Statistical errors and approximation - Classification and Tabulation of data - Frequency distribution.

Unit 2: Statistical Average: Arithmetic - geometric and harmonic means – Mode – Median - Quartiles and Percentiles - Simple and weighted averages - Uses of different averages.

Unit 3: Dispersion: Range - Quartile deviation - mean deviation and their coefficients – Standard deviation - Coefficient of variation.

Unit 4: Correlation: Karl person's coefficient of correlation - Spearman's rank correlation – Concurrent deviation method - Regression equations.

Unit 5: Index Numbers: Utility of index numbers - Problems in the construction of index numbers - simple and weighted index number - Base shifting Fisher's ideal index number and tests of reversibility.

Text Books:
1. Gupta. S.C, Kapoor.V. K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2001.
        Unit 1: Chapter 1(sec 1.1 - 1.4)
2. Arumugam.S & Thangapandian Issac. A,   Statistics, New Gamma Publication House, 2013.
        Unit 2: Chapter 2 (sec 2.0 -2.4 (except deciles))
        Unit 3: Chapter 3
        Unit 4: Chapter 6 (sec6.1 -6.4)
        Unit 5: Chapter 9 (sec 9.1)
3. Dr. Selva Raj.V.M, Business Statistics, Bavani Publications, 2011.
        Unit 1: Chapter 1

Reference Books:
1. Gupta. S. P, Fundamentals of Statistics, Sultan Chand Publishers, New Delhi, 2007.

2. Elhance. D. N, Fundamentals of Statistics, New Century Book House, 2011.
3. Gupta. S. P, Statistical Methods, Sultan Chand & Sons, 2001
4. Dr. Vittal. P. R,   Mathematical Statistics, MARGHAM Publications, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying					3
K4: Analysing		4	4		
K5: Evaluating				5	
K6: Creating					

Mean= 3.6

MAS 2477   NUMERICAL AND STATISTICAL METHODS (COS)   5Hrs/ 4Cr

The aim of this course is to enable the students to acquire basic tools in numerical and statistical methods for solving real life problems in business, industry, agriculture and medicine.

At the end of the course, students will be able to

  i.   demonstrate various numerical methods and use them to solve algebraic, transcendental and system of linear equations.
  ii.   identify interpolations on equal/unequal intervals and solve relevant problems using appropriate methods.
  iii.   use numerical methods with various mathematical operations such as differentiation and integration.
  iv.   demonstrate to obtain measures of central tendencies /dispersion with examples.
  v.   apply the basic probability rules to solve problems and calculate correlations.

Unit 1: Solving algebraic and transcendental equations – Bisection method – Regula Falsi method - Iteration method – Newton Raphson method - Solving system of linear equations - Gauss elimination – Gauss Jordan method.

Unit 2: Interpolation – Equally spaced intervals - Newton's forward and Backward – Gauss forward and Backward – Stirlings formula - Unequally spaced intervals – Lagrange method – Hermite method.

Unit 3: Numerical differentiation - Newton's forward and backward formula - Stirlings formula - Numerical integration – Trapezoidal – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solving differential equation - Euler's method – Runge Kutta 2nd and 4th order formula.

Unit 4: Measures of central tendency – mean – median – mode – Geometric mean – Harmonic mean – Measure of Dispersion – Range – Standard deviation – Quartile Deviation .

Unit 5: Probability - Conditional probability - Probability distributions – Binomial – Poisson – Normal distributions - Correlation – Correlation coefficients – Rank Correlation.

Text Books:
1. Sastry S.S , Introductory method of Numerical Analysis, Prentice Hill of India, 2000
       Unit 1: Chapter 2(sec 2.1- 2.5) Chapter 5(sec 5.3.2)
       Unit 2: Chapter 3 (sec 3.6, 3.7.1, 3.7.2, 3.9.1, 3.9.2)
       Unit 3: Chapter 4(sec4.2, 4.4 (4.4.1, 4.4.2)), Chapter 6 (sec 6.4, 6.5)
2. Arumugam. S and Thangapandian Issac. A, Statistics, New Gamma puplishing House, 2004.
       Unit 4: Chapter 2(sec 2.1,2,2,(only Median)2.3,2.4) , Chapter 3 (sec 3.1)
       Unit 5: Chapter 11 (sec 11.1, 11.2), Chapter 13 (sec 13.1, 13.2, 13.3),
            Chapter 6 (sec 6.1, 6.2)

Reference Books:
1**.** Jain. M. K, Jain. R. K &,Iyengar. S. R. K , Numerical methods for scientific &engineering, New Age international, 1995.
 2. Venkataraman. M. K, Numerical methods for science and engineering, National Publishing company, 1999.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	3
K4: Analysing			4		
K5: Evaluating					
K6: Creating					

Mean= 3

MAS 2438   **BUSINESS MATHEMATICS (CIT)**   **5Hrs / 4Cr**

 This course is designed to explore the techniques in mathematics and statistics which can be used in environment and managerial skills.

At the end of the course, students will be able to

    i.   the basic principles of sets and functions with examples.
    ii.   demonstrate identify the concepts of matrix algebra.
    iii. discuss the concepts of time series with examples.
    iv. use the basic probability rules and apply probability theory using Bayes' Rule.
    v.   recognize to solve problems using theoretical distributions.

Unit 1: Set theory: basic operations - Universe of sets - Functions - Venn diagrams.

Unit 2: Matrices and Determinants - Definition of a matrix - Types of matrices - Algebra of matrices - Properties of determinants - Calculation of values of determinants upto third order - Adjoint of a matrix - elementary row or column operations - Finding inverse of a matrix through Adjoint and elementary row and column operations –

Solution of a system of linear equations (having unique solution and involving not more than three variables) using matrices - Input Output Analysis.

Unit 3: Analysis of Time series - Causes of variation, components of a time series - Decomposition - additive & multiplicative models - determination of trend - Moving averages - least squares (Linear, Parabolic & Exponential trend) - Seasonal Indices – simple averages - ratio to trend - link relative methods.

Unit 4: Theory of Probability – concepts - addition & multiplication laws of probability – conditional probability - Baye's Theorem.

Unit 5: Theoretical distribution – Binomial-Poisson and Normal Distributions.

Text Books:

1. Sancheti .D.C, and Kapoor .V.K, Business Mathematics, Sultan Chand &Sons,1993.
    Unit 1: Chapter 2(sec 2.1-2.12, 2.19- 2.24)
    Unit 2: Chapter 20 (sec 20.1-20.12, 20.14 - 20.15, 20.17- 20.22)
2. Sundaresan.V, Jeyaseelan.S.D , An Introduction to Business Mathematics,2012, S.Chand, 2012.
    Unit 2: Chapter 8 (sec 8.7)
3. Arumugam. S., & A. Thangapandian Isaac, Statistics, New Gamma Publication House, 2004.
    Unit 3: Chapter 10 (sec 10.1, 10.2, 10.3)
    Unit 4: Chapter 11 (sec 11.1, 11.2)
    Unit 5: Chapter 13 (sec 13.1, 13.2, 13.3)

Reference Books:

1. Gupta. S.C, Kapoor. V. K, Mathematical Statistics, Sultan Chand & Sons, 2001.
2. Gupta .S P,   Statistical methods, Sultan Chand & Sons, 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	
K4: Analysing					4
K5: Evaluating					
K6: Creating			6		

Mean= 3

MAS 2440 **OPERATIONS RESEARCH (BCA)** **5Hrs / 4Cr**

To introduce to certain quantitative techniques in operations research will enhance the analytical ability of the students.

At the end of the course, students will be able to

i. formulate Linear Programming Problem (LPP) and predict solutions of LPP using graphical and simplex methods.

ii.   compute optimum solution of both balanced and unbalanced transportation problem.
iii.   identify the concept of assignment problem and its solutions.
iv.   compute best strategy in game theory using dominance and graphical method for both pure and mixed strategy.
v.   design new models imitating PERT/CPM, solve PERT/CPM, predict the probability of project completion time.

Unit 1: Linear programming problem (L.P.P) – Mathematical formulation – Graphical solution – General L.P.P – Standard form – Canonical form – Solution to L.P.P by simplex method.

Unit 2: Transportation problem – Mathematical formulation – Finding initial basic feasible solution – Northwest corner rule, least cost method and Vogel's approximation method – Moving towards optimality – Unbalanced transportation problem.

Unit 3: Assignment problem – Mathematical formulation – Hungarian algorithm – Unbalanced assignment problem – Special cases – Travelling salesman problem.

Unit 4: Game theory – Introduction – Two person zero sum games – Maximin, minimax principle – Saddle points – Games without saddle points – Solution of 2 x 2 games – Graphical method – Dominance property.

Unit 5: Networking – Network and Basic components – Rule of network construction – Time calculations – Float or slack values – Critical path – CPM & PERT.

Text Book:
 1. Kantiswarup, Gupta and ManMohan, Operations Research, Sultan Chand and Sons, 2004.
        Unit 1:   Chapter 2(sec 2.2), Chapter 3(sec 3.1, 3.2, 3.4, 3.5), Chapter 4(sec 4.3)
        Unit 2: Chapter 10(sec 10.1, 10.2, 10.9, 10.10, 10.14)
        Unit 3: Chapter 11**(sec** 11.1, 11.2, 11.3, 11.4, 11.6)
        Unit 4: Chapter 17: 17.1 -17.7
        Unit 5: Chapter 21: 21.1 -21.7.

Reference Books:
        1. Kapoor.V.K , Operations Research, Sultan chand and sons , 1997.
        2. Gupta. P.K and ManMohan, Problems in Operation Research, Sultan Chand and Sons, 2010.
        3. Arumugam. S & Thangapandian Isaac.A, Operations Research, New Gamma Publishing house, 2003.
        4. Sundaresan.V, Ganapathy Subramanian. K. S, Ganesan. K, Resource Management Techniques, A. R. Publications, 2002.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying			3		
K4: Analysing		4		4	
K5: Evaluating					
K6: Creating	6				6

Mean =4.6

MAS 2454   **BIOSTATISTICS**   **5Hrs / 4Cr**

The main objective of the course is to inculcate the students with statistical skills needed to deal with contemporary nature of biological and clinical experiments. It also acquaints students with basic concepts of data collection and sampling methods. Special emphasis was given to probability distribution and hypothesis testing which help the students to apply the methods of distribution in various experimental problems. To fulfil the research thrust of the students a unit on research methodology was added to the course.

At the end of the course, students will be able to:

    i.   recognize and identify the basics of statistics and classify variables ascategorical/quantitative
    ii. differentiate between central tendencies and dispersion with examples.
    iii. interpret and calculate the correlation and regression between two variables.
    iv. apply the basic probability rules and theoretical distributions to solve problems.
    v. identify and solve the problems on sampling distribution, ANOVA.

Unit 1: Definition of statistics - Characteristics of statistics - Statistical Methods - Uses of statistics in Biology - Data types - Collection of data – Classification – Tabulation - diagrammatic representation.

Unit 2: Statistical tools - measures of central tendency - mean, median and mode, Harmonic mean, Geometric mean - measures of dispersion - mean deviation - standard deviation -coefficient of variation .

Unit 3: Correlation: Types of correlation - Karl Pearson's co-efficient of correlation - Rank correlation - Regression lines.

Unit 4: Probability: Introduction - Basic definitions – simple problems – theoretical distribution – binomial – Poisson - normal distributions and applications.

Unit 5: SamplingHypothesis - t-test - F-test - chi square test for goodness of fit – ANOVA - definition – classification - one criteria and two criteria - simple problems - overview of research methodology.

Text book:

1. S. Palanichamy & Manoharan, 1990. Statistical Methods for Biologists, Palani Paramount publications

       Unit 1: Chapters 1, 2 – 2.1, 2.3, 2.4
       Unit 2: Chapters 3, 4.1 – 4.4
       Unit 3: Chapters 6.1, 6.2, 7.1, 7.2
       Unit 4: Chapters 8, 9
       Unit 5: Chapters 10, 11, 12
References:

1. S. Arumugam, Isaac, Statistics, New gamma Publishers, 2008
2. Dr. Pranab kumar banarjee, Introduction to Biostatistics, S.Chand & company ltd.2011
3. Elhance, D.N and Agarwal, Fundamentals of Statistics, Kitab Mahal Ahamedabad. 2003.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying				3	3
K4: Analysing	4	4			
K5: Evaluating			5		
K6: Creating					

Mean= 3.8

MAS 2466   **BUSINESS MATHEMATICS (CMC)**   **5Hrs / 4Cr**

 This course is designed to explore the techniques in mathematics and statistics which can be used in environment and managerial skills.

At the end of the course, students will be able to

  i.   demonstrate the basic principles of sets and functions with examples.
  ii. identify the concepts of matrix algebra.
  iii. discuss the concepts of time series with examples.
  iv. use the basic probability rules and apply probability theory using Bayes' Rule.
  v.   recognize and solve problems using theoretical distributions and tests of significance.

Unit 1: Set theory: basic operations - universe of sets - functions - Venn diagrams.

Unit 2: Matrices and Determinants - Definition of a matrix - Types of matrices - Algebra of matrices - Properties of determinants - Calculation of values of determinants up to third order - adjoint of a matrix - elementary row or column operations - Finding inverse of a matrix through adjoint and elementary row and column operations – Solution of a system of linear equations (having unique solution and involving not more than three variables) using matrices - Input Output Analysis.

Unit 3: Analysis of Time series: Causes of variation, components of a time series – Decomposition - additive & multiplicative models, determination of trend - Moving averages - least squares (Linear, Parabolic & Exponential trend) - Seasonal Indices – simple averages - ratio to trend - link relative methods.

Unit 4: Theory of Probability: concepts - addition & multiplication laws of probability – Conditional probability - Baye's theorem.

Unit 5: Theoretical distribution - Binomial, Poisson distribution - Test of significance - Chi-square test, T-tests.

Text Books:
1. Sanchetti Kapoor, Business Mathematics, Sultan Chand & Sons, New Delhi, 2009.
         Unit 1: Chapter 2 (sec 2.0 -2.20)

Unit2: Chapter 20 (sec 20.0 - 20.24)
2. Sundaresan. V, Jeyaseelan. S. D, an Introduction to Busines mathematics, S. Chand, 2013.
   Unit 2: Chapter 8 (sec 8.7)
3. S. Arumugam, & A. Thangapandian Isaac, Statistics, New Gamma Publication House, 2013.
   Unit 3: Chapter 10
   Unit 4: Chapter 11
   Unit 5: Chapter 13 (sec 13.1 & 13.2), Chapter 15 (sec 15.1) and
      Chapter 16(sec 16.1 & 16.2)

Reference Books:
  1. Gupta. S. C, Kapoor. V. K, MathemSuatical Statistics, Sultan Chand & Sons, 2001.
  2. Gupta. S. P , Statistical methods, ltan Chand & Sons, 2001.

Bloom's Taxonomy	Unit 1 CO1	Unit 2 CO2	Unit 3 CO3	Unit 4 CO4	Unit 5 CO5
K1: Remembering					
K2: Understanding	2				
K3: Applying		3		3	
K4: Analysing					4
K5: Evaluating					
K6: Creating			6		

Mean= 3.6

MAS 2472   **BIOSTATISTICS (MIC)**   **5Hrs / 4Cr**

To introduce to the students the basic techniques in statistics, will enhance their ability to validate their experimental results. The course deals with the fundamentals of bio-statistics, sampling methods, data types and presentation, measures of central tendencies and dispersion, distribution patterns and various tests of inferential statistics.

At the end of the course, students will be able to:

 i. recognize and identify the basics of statistics and classify variables as categorical/quantitative
 ii. differentiate between central tendencies and dispersion with examples.
 iii. interpret and calculate the correlation and regression between two variables.
 iv. apply the basic probability rules and theoretical distributions to solve problems.
 v. identify and solve the problems on sampling distribution, ANOVA.

Unit 1: Definition of statistics - Characteristics of statistics - Uses of statistics in Biology – Data types - Collection of data – Classification – Tabulation - Diagrammatic representation.

Unit 2: Measures of central tendencies: Mean and its types - Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Co-efficient of standard deviation, Standard error, Variance.

Unit 3: Correlation Analysis: Types of correlation - Karl Pearson's co-efficient of correlation - Rank correlation - Regression lines.

Unit 4: Sampling: Types of sampling - Parameters and statistic - Null and alternate hypothesis - Test of significance of small samples - T-test, F-test and chi-square test for goodness of fit.

Unit 5: Analysis of variance- One-way and two way classification- Latin square design.

Text Books:

1. Palanichamy.S & Manoharan, Statistical Methods for Biologists, Palani Paramount Publications, 1990.
        Unit 1: Chapter 1(sec1.1-1.7), Chapter 2(sec2.1-2.4)
        Unit 2: Chapter 3, Chapter 4(sec 4.1- 4.4)
        Unit 3: Chapter 7(sec7.1-7.2(coefficient of correlation and rank correlation))
        Unit 4: Chapter 10(sec 10.1-10.3 and 10.6), Chapter 11
        Unit 5: Chapter 12

2. Arumugam. S & Thangapandian Issac. A, Statistics, New Gamma publishing house, 2008.
        Unit 5: Chapter 17 (sec17.3)

Reference Books:
1. Gupta, Statistical Methods, S.Chand&co, 2001.
2. Subatra.R. & Ms. Shrividya .R, Probability and statistics, Tech-Max publications, 2006.
3. Pranab kumar banarjee, Introduction to Biostatistics, S.Chand & company ltd.2011
4. Elhance, D.N and Agarwal, Fundamentals of Statistics, Kitab Mahal Ahamedabad, 2003.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying				3	3
K4: Analysing	4	4			
K5: Evaluating			5		
K6: Creating					

Mean= 3.8

MAT / MAS 1221   ARITHMETIC AND MATHEMATICAL LOGIC   3Hrs / 2Cr

The course is intended for the students who are not majoring in mathematics as a non-major elective. The basic algebraic concepts including the principle of mathematical induction are introduced. The basic structure in mathematics called set is introduced by means of real life examples. The idea of truth table and its consequence in resolving situations in which the truth value is either true or false is studied at length.

At the end of the course, students will be able to

i. apply the basic concepts of quantitative and arithmetic ability to solve problems in competitive exams.
ii. gain basic knowledge of statistics which is applicable in real life.
iii. outline the basic principles and operations on sets
iv. write symbolic representation of statements .
v. analyze the validity of a statement using truth table.

Unit 1: Odd man out series - Percentage - Profit and Loss – Discount - Data interpretation.

Unit 2: Mean – Median – Mode.

Unit 3: Operations on set – Algebra of sets – Finite and Infinite set – Principles of Mathematical Induction.

Unit 4: Truth tables – Disjunction – Conjunction – Implication.

Unit 5: Laws of Logic – Tautology – Contradiction – Conjunctive and Disconjunctive Normal forms.

Text   Books:
1. Aggarwal. R. S , Quantitative Aptitude , S . Chand and Company Ltd, 2014.
            Unit 1: Sec I: 35, 10, 11, 32 and Sec II: 36, 37
2. Arumugam. S & Thangapandian Issac. A, Statistics, New gamma publication House , 2013
            Unit 2: Sec 2.1 – 2.3 simple problems
3. Venkatraman .M.K, Discrete Mathematics, The normal publishing company, 2000.
            Unit 3: Chapter 1 (sec 1.1 – 1.6) and chapter 4 (sec 4.2)
            Unit 4: Chapter 9 (sec 9.1 -9.3)
            Unit 5: Chapter 9 (9.6 – 9.8   and 9.12)

Reference Books:
1. Stoll. R.S, Set Theory and Logic, Eureka publishing House, 1997.
2. Tremblay .J.P, Manohar. R, Discrete Mathematical Structure with applications to Computer science, Tata Mc-Graw -Hill, 2011.
3. Seymour Lipschutz , Schaum's theory and problemsof set theory Mc-Graw-Hill, 1964.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding			2		
K3: Applying	3				
K4: Analysing		4			4
K5: Evaluating					
K6: Creating				6	

Mean= 3.8

MAT / MAS 1222   RECREATIONAL MATHEMATICS   3Hrs / 2Cr

The course is intended for the students who are not majoring in mathematics as a non-major elective. Mathematics is called the Queen of sciences. It is sometimes perceived as incomprehensible. Mathematics can be fun is the theme of this course.

At the end of the course, students will be able to

i.   create magic squares of different orders.
ii. demonstrate Fallacies and Paradoxes with examples.
iii. compute products and divisions using speed arithmetic.
iv. demonstrate simple combinatorial rules with real time examples.
v.   design recurrence relation for simple models like tower of Hanoi and Fibonacci.

Unit 1: Magic squares – Definition – History – Creation of magic square - Odd order (2m+1) - Single even order(2(2m+1)) – Double even order (4m) .

Unit 2: Fallacies- Paradoxes.

Unit 3: Multiplication rules – Divisibility rules.

Unit 4: Combinatorics – Rule of sum – Rule of product – Combination – Permutations – Basic level problems.

Unit 5: Recurrence relations – Tower of Hanoi problem – Fibonacci numbers – Related results.

Text Books:

1. Rouse ball, H. S. M. Coxter, Mathematical Recreations and essays 13th edition, Dover Publications, 2003.
          Unit 1: Chapter 7(page no 193-199)
2. Maxwell. E.A, Fallacies in mathematics, Cambridge University press , 1969.
          Unit 2: Chapter 1& 6
3. Jagadguru swami Sri Bharathi Krishna tirthaji maharaja, Vedic mathematics, Banarsidass publishers, Delhi 2006.
          Unit 3: Chapter 2 & 3
4. Balakrishnan.V.K, Schaum's outline of combinatorics, Tata Mc Graw - Hill publishing company Limited, Delhi 1995.
          Unit 4: Chapter 1 (Basic level problems)
          Unit 5: Chapter 3 (Basic level problems)

Reference Books:
1. Tucker A.W, Applied Combinatorics, John & Sons Wiley, 2000.
2. Cohen D, Combinatorics, Wiley, 1978.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding		2		2	
K3: Applying					
K4: Analysing			4		
K5: Evaluating					
K6: Creating	6				6

Mean= 4

MAT / MAS 1231   MATHEMATICS FOR LIFE   3Hrs/2Cr

This course attempts to show what mathematics is, how it has developed from man's efforts to understand and model nature, how the mathematical approach to real problem can be accomplished, to what extent mathematics has modeled on civilization and culture. The course aims at enabling the students to acquire mathematical knowledge for technical proficiency.

At the end of the course, students will be able to

    i.   compile the brief history of calendars, compare and contrast various number systems.
    ii.   demonstrate speed arithmetic for multiplication and division.
    iii.   outline few graph theory models in real life.
    iv.   compile daily/monthly/annual astronomical events.
    v.   demonstrate with a diagram the conditions favorable for lunar and solar eclipse.

Unit 1: History and types of calendar - Various number bases subsist in the history - Number puzzles and Logical puzzles.

Unit 2: Speed arithmetic- Complementation rule - Product near the base 10^k - Division- Square root.

Unit 3: Konigsberg bridge problem- Jordan curve-Planarity-Map coloring.

Unit 4: Synodic month - Sidereal month - Relation between synodic and sidereal month - Elongation of Moon - Phase formula.

Unit 5: Lunar eclipse - Types and condition for its occurrence - Partial and total Solar eclipse - Condition for the occurrence of solar eclipse.

Text books:

1. Kumaravel and Mrs. Kumaravel, Astronomy, Shri Vishnu arts, Sivakasi, 2004.
    Unit 1: Chapter 7(Sec 3).
    Unit 4: Chapter 12.
    Unit 5: Chapter13.
2. Glover. J. T, Vedic Mathematics, Mothilal Banarsidass publishers, 1995.
    Unit 2: Chapters: 2,3,4,5.
3. Arumugam.S. and Ramachandran.S ,Invitation to Graph Theory, SciTech Publications (India) Pvt. Ltd., 2004.
    Unit 3: Pages: 1-10, 73-82, 85-98.

Reference Books:
1. Galbraith.P, Blurn.W, Booker.G, and Ian D. Hurtles, Mathematical models, Harwood publisher, Chichester, 1993.
2. Arthur berry, Astronomy, Dover publication, 1991.
3. George J. Summer, The great book of puzzles and teasers, Jaico publishing house.
4. John Clarke & Derek Allan Holton, A first look at Graph Theory, World Scientific Publishing Co. Ltd., 1995.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding		2			2
K3: Applying			3		
K4: Analysing	4			4	
K5: Evaluating					
K6: Creating					

Mean = 3

MAT / MAS 1232   MATHEMATICAL REASONING   3Hrs/2Cr

The course is introduced to all the first year students as a life skill course. This course aims at developing logical thinking and mathematical reasoning. The science of coding and decoding is a hallmark in this era of communication and networking. A logical deduction is an important tool for any sequential programming which is an essence of the present electronic era.

At the end of the course the student will be able to

  i.   predict the relation with verbal reasoning.
  ii. predict the relation with non-verbal reasoning.
  iii. analyze the sense of directions.
  iv. use logical deductions to verify the validity of the conclusion.
  v.   differentiate cause and effect, derive conclusions from passage.

Unit 1: Blood relation - Deciphering jumbled up descriptions, Relation puzzle and coded relations.

Unit 2: Coding and Decoding - Letter decoding, Direct letter coding, Number/symbol coding - Matrix coding – Substitution - Deciphering message word codes – Deciphering number and symbol codes for messages - Jumbled coding.

Unit 3: Puzzle test: Classification type - Seating/placing arrangements - Comparison type - Sequential order of things - Selection based on given conditions - Family based puzzles.

Unit 4: Logical deduction - Arguments- Assumptions - Courses of Actions - Conclusions.

Unit 5: Deriving conclusions from passages - Theme deduction - Cause and effect reasoning.

Text Book:
  1. Aggarwal. R. S, A Modern Approach to verbal & non-verbal reasoning, S.chand& company Ltd., 2006.
      Unit 1: section 1: 5
      Unit 2: section 1: 4
      Unit 3: section 1: 6
      Unit 4: section 2: 1, 2,3,4,5
      Unit 5: section 2: 6, 7, 8

Reference Books:
1. Aggarwal. R. S, A Modern Approach to verbal reasoning, S.chand& company Ltd., 2006.
2. Aggarwal. R. S, A Modern Approach to non-verbal reasoning, S.chand& company Ltd., 2006.
3. Aggarwal. R.S, A Modern Approach to logical reasoning, S.chand& company Ltd., 2006.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying				3	
K4: Analysing			4		4
K5: Evaluating					
K6: Creating	6	6			

Mean = 4.6

MAT /MAS 3231 MATHEMATICS FOR COMPETITIVE EXAMINATIONS 3Hrs/2Cr

This course is designed for non major students who intent to apply for various competitive examinations. Though, no new concepts in mathematics are introduced whatever the students have learnt till their secondary level is called. Adequate training is given so that they will overcome the fear of numbers with the required level of speed and accuracy. This will provide strategies and methods to solve problems in Mathematics section of any competitive examinations.

At the end of the course, students will be able to

i.   express the efficiency in dealing with multiplication and division on numbers
ii.   identify and demonstrate the use of arithmetic mean, geometric mean and harmonic mean in real life situations.
iii. demonstrate the use of mathematical logic as a tool for solving problems
iv.   effectively use inclusion and exclusion principle for counting.
v.   enumerate the techniques and tools in calculating measures of standard geometric objects.

Unit 1: Numbers - problems on numbers - H.C.F and L.C.M – Divisibility –Simplification.

Unit 2: Arithmetic mean - Geometric mean – Harmonic mean.

Unit 3: Mathematical logic – conjunction – disjunction – negation – implications – Equivalence of statements – disjunctive and conjunctive normal forms.

Unit 4: Venn diagram – Inclusion and exclusion principle.

Unit 5: Measures of standard geometric objects.

Text Books:
1. Aggarwal R. S, Quantitative Aptitude, S. Chand & company Ltd., Revised edition, 2008.
        Unit 1: Chapters 1, 2 & 4

Unit 2: Chapter 6
Unit 5: Chapters 24 & 25
2. Discrete Mathematics, Schaum's outline series, McGraw Hill, 1992.
    Unit 3: Chapter 12
3. Set theory and Related Topics, Schaum's outline series, McGraw Hill, Second Edition 1998.
    Unit 4: Chapter 1

Reference Books:
1. Arumugam.S, &ThangapandianIssac.A, Statistics, New gamma publication House, 2013.
2.Tremblay J.P, Manohar R, Discrete Mathematical Structure with applications to computer science, Tata McGraw - Hill, 2011.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	2		2		
K3: Applying		3			3
K4: Analysing					
K5: Evaluating				5	
K6: Creating					

Mean= 3

MAT / MAS 3232 DEVELOPING QUANTITATIVE APTITUDE 3Hrs / 2Cr

This course will enable the students to develop their quantitative skills that strengthen their edge over others in competitive examinations.

At the end of the course, students will be able to

 i. formulate problems connected with age, numbers as simultaneous equations and solve
 ii. solve problems involving ratio and proportion, profit and loss
 iii. convert time and work, time and distance, pipes and cistern into mathematical equations and solve
 iv. solve problems involving simple/ compound interest and solve problems on mixture using allegation rule.
 v. identify the rules governing indices and surds, and logarithms and solve simple problems.

Unit 1: Simplification - Simultaneous simple equations – Problems on numbers - Problems on ages –Decimal fractions – Average - Partnership.

Unit 2: Ratio and proportion- Variation- Profit and loss.

Unit 3: Time and work- Pipes and cistern-Time and distance.

Unit 4: Simple interest- Compound interest- Allegation and mixture.

Unit 5: Indices - Surds - Logarithms.

Text Book:
1. Aggarwal R.S. Quantitative Aptitude, S. Chand & company Ltd., 2006
    Unit 1: Chapters 4, 7, 8, 3,6,13
    Unit 2: Chapters 11, 12, 14
    Unit 3: Chapters 15, 16, 17
    Unit 4: Chapters 21, 22, 20
    Unit 5: Chapters 9, 23

Reference Books:
1. Sundaresan.V & Jeyaseelan. S. D, An Introduction to Business Mathematics, S. Chand & company Ltd., 2003.
2. Elango, Business Mathematics, S. Chand & company Ltd., 2001.

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding					
K3: Applying			3		3
K4: Analysing					
K5: Evaluating					
K6: Creating	6	6		6	

Mean= 4.8