DEPARTMENT OF MATHEMATICS (UG)

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Techzone, Pollachi Road, Eachanari, Coimbatore – 641021

Syllabus for

B.Sc. Mathematics

(I, II, III, IV, V & VI Semester)

2019-2020 Batch onwards

Vision and Mission of the Institution:

VISION

A world renowned INDUSTRY-INTEGRATED INSTITUTION that imparts knowledge, skill, and research culture in young men and women to suit emerging young India.

MISSION

To provide quality education at affordable cost, and to maintain academic and research excellence with a keen focus on INDUSTRY-INTEGRATED RESEARCH AND EDUCATION.

MOTTO
Meaningful INDUSTRY-READY education and research by all means

Vision and Mission of the Department:

VISION

The Department aspires to the highest standards of excellence in teaching, through preparing students for learning Pure, Applied and Industrial Mathematics for the Challenging Growth of Science and Technology.

MISSION

The Mission of the Department is to provide an environment where students can learn and become competent users of mathematics and mathematical application. Also to provide Quality Education, Research and Consultancy by Providing Highly Skilled mathematical Knowledge along with the Industrial collaboration.

Program Educational Objectives (PEO)

PEO 1: Mathematical knowledge. Apply the fundamental concepts of Mathematics to think logically and technically.
PEO 2: Problem solving skills. 4.Discover the Mathematical and Computational Techniques to solve the problems.

PEO 3: Industry Collaboration. Discuss the multidisciplinary knowledge through projects and industrial training and providing a sustainable competitive edge in meeting the industry needs.

PEO 4: Employability Skill: 3.   Perceive to become a eminent Mathematician with the Excellent Employability and Research Skill.

Mapping of Institute Mission to PEO

Institute Mission	PEO's
Imparting Knowledge and Skill	PEO1, PEO2
Research Culture	PEO2
Industry collaboration	PEO3
Emerging young India	PEO4

Mapping of Department Mission to PEO

Department Mission	PEO's
Imparting Critical thinking ability to become more Competency	PEO1, PEO2
Analytical Knowledge with Industry collaboration	PEO3, PEO4
Research Culture	PEO1

Program Outcomes (PO):

PO1 : Remember the fundamental concepts of Mathematics

PO2 : Imbibe the skills necessary to effectively translate mathematical aspects to the general public.

PO3 : Understand the Pedagogical Knowledge specific to Mathematics Teaching and Learning for the Lifelong Learning.

PO4 : Develop the Critical thinking ability so as to improve the Employability and Decision making.

PO5 : Apply the Mathematical Models to solve critical problems.

PO6 : Discuss the importance of compliance with the ethics of science to maintain sustainable environment.

PO7 : Compare the different Mathematical Models to produce accurate and precise results.

PO8 : Explain the use of mathematical and computational modeling of real decision making.

PO9 : Decipher the importance of being ethical, moral and social values in personal and social life emerging as a highly cultured and civilized personality.

Correlation between the POs and the PEOs

Program Outcomes		PEO1	PEO2	PEO3	PEO4
PO1	:	√			√
PO2	:		√	√	
PO3	:	√		√	
PO4	:	√	√	√	
PO5	:	√			√
PO6	:		√		
PO7	:			√	√
PO8	:		√		√
PO9	:			√	

Components considered for Course Delivery is listed below:

1. Class room Lecture   -   I
2. Laboratory class and demo   -   II
3. Assignments   -   III
4. Mini Project   -   IV
5. Project   -   V
6. Online Course   -   VI
7. External Participation   -   VII
8. Seminar   -   VIII
9. Internship   -   IX

Mapping of POs with Course Delivery:

Program Outcomes	I	II	III	IV	V	VI	VII	VIII	IX
PO1	√		√	√				√	√
PO2		√			√	√	√		√
PO3	√			√	√	√		√	
PO4		√			√		√		√
PO5	√	√	√			√			√
PO6		√		√	√		√	√	√
PO7		√		√	√	√			
PO8	√		√	√			√		
PO9		√			√			√	√

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Scheme of curriculum for
B.Sc. Mathematics

for the students admitted in the Batch during 2019 - 2020
Board of Studies – Mathematics (UG)

S.No	Sem	Part	Sub Type	Sub Code	Subject	Credits	Hours	Int	Ext	Total
Curriculum Structure - Regulation - 2019										
1	1	1	L1		Language - I	4	4	40	60	100
2	1	2	L2		English for Communication - I	4	4	40	60	100
3	1	3	Core	19BMA1CA	Core - I - Algebra	4	5	40	60	100
4	1	3	Core Practical	19BMA1CP	Core Practical - Practical Algebra	2	3	40	60	100
5	1	3	DSC	DSC	DSC 1C	4	5	40	60	100
6	1	3	DSC Practical		DSC Practical - 1C	2	3	40	60	100
7	1	3	Allied-I	DSA	DSA 1A	4	5	40	60	100
8	1	4			Ability Enhancement Course I	2	1	50	-	50
9	1	6			Value Added Course - I%	2		100	-	100
1	2	1	L3		Language - II	4	4	40	60	100
2	2	2	L4		English for Communication - II	4	4	40	60	100
3	2	3	Core	19BMA2CA	Core - III - Trignomentry, Vector Calculus & Fourier Series	4	5	40	60	100
4	2	3	Core Practical	19BMA2CP	Core Practical - Trig World	2	3	40	60	100
5	2	3	DSC	DSC	DSC 2C	4	5	40	60	100
6	2	3	DSC Practical		DSC Practical - 2C	2	3	40	60	100
7	2	3	Allied-II	DSA	DSA 2A	4	5	40	60	100
8	2	4			Ability Enhancement Course II	2	1	50	-	50
9	2	6			Value Added Course - II %	2		100	-	100

1	3	3	Core	19BMA3CA	Core - V - Statics	4	6	40	60	100
2	3	3	Core Practical	19BMA3CP	Core Practical - Experimental Statics	2	3	40	60	100
3	3	3	DSC	DSC	DSC 3C	4	6	40	60	100
4	3	3	DSC Practical		DSC Practical - 3C	2	3	40	60	100
5	3	3	Allied-III	DSA	DSA 3A	4	5	40	60	100
6	3	4	SEC	SEC-I	Skill Enhancement Courses – I	2	4	40	60	100
7	3	4			Ability Enhancement Course III	2	1	50	-	50
8	3	6			Value Added Course - III %	2		100	-	100
9	3	6			Inter Department Learning – I#	2	2	-	100	100
1	4	3	Core	19BMA4CA	Core - VII Modern Algebra	4	6	40	60	100
2	4	3	Core Practical	19BMA4CP	Core Practical - Actual Algebra	2	3	40	60	100
3	4	3	DSC	DSC	DSC 4C	4	6	40	60	100
4	4	3	DSC Practical		DSC Practical - 4C	2	3	40	60	100
5	4	3	Allied-IV	DSA	DSA 4A	4	5	40	60	100
6	4	4	SEC	SEC-II	Skill Enhancement Courses – II	2	4	40	60	100
7	4	4			Ability Enhancement Course IV	2	1	50	-	50
8	4	6			Value Added Course - IV %	2		100	-	100
9	4	6			Inter Department Learning – II#	2	2	-	100	100
1	5	3	Core	19BMA5CA	Core - IX Real Analysis -I	4	6	40	60	100
2	5	3	Core Practical	19BMA5CP	Core Practical - Real applications	2	3	40	60	100
3	5	3	DSC	DSC	DSC 5C	4	6	40	60	100
4	5	3	DSC Practical		DSC Practical - 5C	2	3	40	60	100
5	5	3	DSE	DSE – I	Elective - I – DSE	4	4	40	60	100

					1E					
6	5	3	DSE	DSE - II	Elective - II – DSE 2E	4	4	40	60	100
7	5	4	SEC	SEC-III	Skill Enhancement Courses – III	2	4	40	60	100
8	5	6			Value Added Course - V%	2		100	-	100
1	6	3	Core	19BMA6CA	Core - XI Real Analysis -II	4	7	40	60	100
2	6	3	Core Practical	19BMA6CP	Core Practical - Exploring Complexity	2	3	40	60	100
3	6	3	DSE	DSE – III	Elective – III – DSE 3E	4	4	40	60	100
4	6	3	DSE	DSE – IV	Elective – IV – DSE 4E	4	4	40	60	100
5	6	3	Core Course - XI	DSC	Core Project	8	8	40	160	200
6	6	4	SEC	SEC-IV	Skill Enhancement Courses – IV	2	4	40	60	100
7	6	5			Extension Activity- EX %	2		50	-	50
						140	150	2310	2640	4950

Note :
1. Learning the courses – Programming in C, Web Technology, Database & SQL, Software Engineering and Career Enhancement Course – student shall appear for the NSDC Certification – Junior Software Developer.

@ - No End Semester Examination, only Internal Exam.
# - No Internal Examination, only End Semester Exam.

Discipline Specific Core					
S.No	Course Code	Course	Pre-requesite	Offering Department	Mandatory
1	19BMAC01	Calculus	-		
2	19BMACP1	Thinking Calculus-Practical			
3	19BMAC02	Analytical Geometry	-		
4	19BMACP2	Geometry with 2D and 3D-Practical			
5	19BMAC03	Differential Equations	-		
6	19BMACP3	Applicable Derivatives -Practical			
7	19BMAC04	Dynamics	Core 5		
8	19BMACP4	Experimental Dynamics-Practical			
9	19BMAC05	Fuzzy Mathematics	-		
10	19BMACP5	Frizzy Logic-Practical			
11	19BMAC06	Professional Skills	-		
	19BMACP6	Professional Skills-Practical			
12	19BMAC07	Complex Analysis	-		
	19BMACP7	Complex Analysis-Practical			
13	19BMAC08	Abstract Algebra	-		
	19BMACP8	Abstract Algebra-Practical			
14	19BMAC09	Number Theory	-		
	19BMACP9	Number Theory-Practical			
15	19BMAC10	Linear Algebra			
	19BMACP10	Linear Algebra-Practical			
16	19BMAC11	Group Theory			
	19BMACP11	Group Theory--Practical			

Allied

S.No	Course Code	Course	Pre-requesite	Offering Department	Mandatory
1	19BMAA07	Statistics for Mathematics-I	-		
2	19BMAA08	Statistics for Mathematics - II	DSA 1		
3	19BPHA01	Physics	-	PHYSICS	
5	19BCMA03	Principles of Accountancy	COMMERCE-II		
6	19BMAA09	Financial Mathematics	-		
7	19BCSA03	Office Automation	-	CS	
8	19BCHA01	Chemistry-I	-	PHYSICS	
	19BCHA02	Chemistry-II		PHYSICS	

Skill Based Subject

S.No	Course Code	Course	Pre-requesite	Offering Department	Mandatory
1	19BMAS01	Introduction to MATLAB	-		
2	19BCSS09	Programming in C	-	CS	

3	19BMAS02	Mathematica	-		
4	19BCSS10	Programming in C++	SEC 2	CS	
5	19BMAS03	Introduction to Entrepreneurship	-		
6	19BMAS04	Quantitative Aptitude	-		
7	19BMAS05	Actuarial Mathematics	-		
8	19BMAS06	Numerical Methods	-		

Discipline Specific Elective

S.No	Course Code	Course	Pre-requesite	Offering Department	Mandatory
1	19BMAE01	Graph Theory	-		
2	19BMAE02	Astronomy	-		
3	19BMAE03	Operation Research - I	-		
4	19BMAE04	Operation Research - II	DSE 3		
5	19BMAE05	Discrete Mathematics	-		
6	19BMAE06	Mathematical Modelling	-		
7	19BMAE07	Control Theory	-		
8	19BMAE08	Combinatorics	-		

Ability Enhancement Course

S.No	Course Code	Course	Pre-requesite	Offering Department	Mandatory
1	19BCSAFC	Environmental Studies	-	CS	Yes
2	19BCMAFC	Women Studies	-	Commerce II	
3	19BCCAFC	Constitution of India	-	Commerce I	
4	19BPYAFC	Human Rights	-	Psychology	Yes
5	19BTAAFC	Yoga	-	Tamil	
6	19BVCAFC	NCC	-	Viscom	
7	19BENAFC	Communicative English	-	English	
8	19BMAAFC	Quantitative Aptitude	-	Mathematics	

Mapping of Courses and POs:

S- Strong Correlation   **M** – Medium Correlation   **B** – Blank

Course Code	Course Name	Program Outcomes								
		P01	PO2	P03	P04	P05	P06	P07	P08	PO9
19BMA1CA	Core - I – Algebra	S	M	M	M	S		S	M	
19BMA1CP	Core Practical- Practical Algebra	M	S	S	M	S		M		M
DSC	DSC IC	S		M	S	M		S	S	M
DSC Practical	DSC Practical- 1C	M	S	S	M	S	M	M		M
DSA	DSA 1A	S	M	S	S		M		S	S
19BMA2CA	Core-III-Trigonometry, Vector Calculus & Fourier Series	S		M	S	M		S	S	M
19BMA2CP	Core Practical - Trig World	M	S	S	M	S		M		M
DSC	DSC 2C		M	S	M	M	S		M	
DSC Practical	DSC Practical - 2C	S	M	S	M	S	S	M	S	M
DSA	DSA 2A	M		S	S	M		M	S	
19BMA3CA	Core - V - Statics	S	M	M	S	S	M	S		M
19BMA3CP	Core Practical - Experimental Statics	S	M	S	M	S	S	M	S	M
DSC	DSC 3C	S		S	M	M		S	S	
DSC Practical	DSC Practical - 3C	M	S	S	M	S		M		M
DSA	DSA 3A	S		S	M	M		S	S	
SEC-I	Skill Enhancement Courses – I		S	M	S	M	S	S		M
19BMA4CA	Core - VII Modern Algebra	S		M	S	M		M	S	M

19BMA4CP	Core Practical - Actual Algebra	M	S	S	M	S	M	S	S	M
DSC	DSC 4C	S	M	S	M	S	S	M	S	M
DSC Practical	DSC Practical - 4C	M	M	S	S	M	M		S	
DSA	DSA 4A	S		S	M	M		S	S	
SEC-II	Skill Enhancement Courses – II	S	M	S	M	S	S		M	
19BMA5CA	Core - IX Real Analysis -I	S	M	S	M	M	M	S	S	
19BMA5CP	Core Practical - Real applications	M	S	S	M	S	M	S	S	M
DSC	DSC 5C	S	M	M	S			M	S	
DSC Practical	DSC Practical - 5C	M	S	S	M	S	M	S	S	M
DSE – I	Elective - I – DSE 1E		M	S	M	M	S		M	
DSE - II	Elective - II – DSE 2E	S	M	S	M	S	S	M	S	M
SEC-III	Skill Enhancement Courses – III	M		S	S	M		M	S	
19BMA6CA	Core - XI Real Analysis -II	S	M	S	M	M	M	S	S	
19BMA6CP	Core Practical - Exploring Complexity	M	S	S	M	S	M	S	S	M
DSE – III	Elective – III – DSE 3E	S	M	S	M	S	S	M	S	M
DSE – IV	Elective – IV – DSE 4E	M		S	S	M		M	S	
DSC	Core Project	M	S	S	M	S	M	S	S	M
SEC-IV	Skill Enhancement Courses – IV	S	M	S	M	S	S		M	

Semester I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA1CA	Core - I –Algebra	4	5	0	0	Theory

Introduction: This paper focuses on the convergence and divergence of different types of series, the standard methods of solving both polynomial and transcendental type equations.

Course Outcome:

CO1	:	Recall the fundamental concept of expansion and summation.
CO2	:	Examine the concept of roots of equations.
CO3	:	Compare the concept of increase or decrease the roots of the equation.
CO4	:	Understand the fundamental concept of Matrices with respect to real life applications.
CO5	:	Examine the applications of Binomial and Newton theorems.
CO6	:	Discuss the need of being with ethics of science while experimenting Algebraic concepts in society.

Unit I:

Binomial theorem for rational index (statement only)- application and binomial theorem to summation of series- exponential theorem (statement only)- summation of series the logarimatic series summation

Unit II:

Theory of equation – roots of equation (result only) - relation between roots and coefficients- symmetric functions of the roots of an equation

Unit III:

Newton's theorem on sum of the power of the roots (statement and problems only) – transformation of equation – reciprocal equation

Unit IV:

To increase or decrease the roots of the given equation by a given quantity removal of the term – Descartes rule of signs

Unit V:

Matrices – special types of matrices – characteristic roots and characteristic vectors diagonalisation of a matrix

Textbook:

1. T.K. ManikavachagamPillai, T. Natarajan and K.S. Ganapathi,"Algebra Volume I", S. Viswanathanpvt. ltd, 2004. [Unit I to Unit IV]

2. P.Kandasamy, K.Thilagavathi, " Mathematics for B.Sc Branch -I, Volume I", S. Chand and Company Pvt.Ltd, 2015**.** [Unit V]

Contents:

Unit I	Chapter-5	Page Number :124-130, 143-152, 191-207, 224-230,
Unit II	Chapter-6	Page Number : 282-307.
Unit III	Chapter-6	Page Number : 309-327.
Unit IV	Chapter-6	Page Number : 327-337, 351-354.
Unit V	Chapter-1	Page Number : 3-8 .
	Chapter-4	Page Number : 57-97.

References:

1. N.P. Bali, " Algebra", Laxmi Publications pvt. Ltd, New Delhi, 2009.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	PO9
CO1	L	H		M					
CO2	L	H	L						
CO3	L	H	L	M			M		
CO4	L		L		M				
CO5	L		L			H		H	
CO6	L					H			H

Semester I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA1CP	Core Practical - Practical Algebra	2	0	0	3	Practical

Introduction: This course enables the students to understand about the applications of algebraic concepts in real life.

Course Outcome:

CO1	:	Apply the fundamental concept of expansion and summation.
CO2	:	Examine the concept of roots of equations.
CO3	:	Compare the concept of increase or decrease the roots of the equation
CO4	:	Analyze the concept of Matrices with respect to real life applications
CO5	:	Examine the applications of Binomial and Newton theorems

1. Find out Weather forecasting with the help of Binomial theorem

2. Find out Cancer growth and Bacteria growth by using exponential theorem

3. Find out Earthquakes rate by using logarithmic series

4. List out the Application of roots of equation in Internet searching

5. List out the Application of roots of equation in medicine

6. Create some symmetric objects

7. Solve Rhombic cube problems

8. Identify Some real life application about Newton's theorem

9. Applications of Matrices in Finger print

10. Identify some Application of Matrices in Some Agriculture

11. Identify some real life applications of matrices in Science and technology.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M					
CO2	L	H	L						
CO3	L	H	L	M			M		
CO4	L		L		M				
CO5	L		L			H		H	H

Semester II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA2CA	Core - III – Trigonometry, Vector Calculus and Fourier series	4	5	0	0	Theory

Introduction: This paper presents the circular functions, hyperbolic functions, Differentiation of functions in scalar that enable the students to learn about the expansion of trigonometric functions.

Course Outcome:

CO1	:	Understand the concept of trigonometric equations, triangles, and applications.
CO2	:	Demonstrate the concept of several trigonometric identities and use them to verify other identities.
CO3	:	Evaluate trigonometric and inverse trigonometric functions.
CO4	:	Determine gradient vector fields and find potential functions
CO5	:	Apply Fourier analysis to half range series.
CO6	:	Develop conceptual understanding and fluency with trigonometric functions, techniques, vector calculus and manipulations.

Unit I:

Expansion in Series – Expansion of $\cos^n\theta$, $\sin^n\theta$ in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$ and $\sin n\theta$ in powers of sines and cosines .Expansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in powers of θ – hyperbolic functions and inverse hyperbolic functions.

Unit II:

Logarithm of complex quantities - summation of series – when angles are in arithmetic progression – C + iS method of summation – method of differences.

Unit III:

Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl.

Unit IV:

Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Stokes theorem – (Statements only) - verification of the above said theorems.

Unit V:

Periodic functions – Fourier series of periodicity 2π – half range series.

Textbook:

1. T.K. ManichavasagamPillai and S.Narayanan," Trigonometry", Viswanathan Publishers and Printer Pvt. Ltd,2013. [Unit I&II]

2. P.Duraipandian and KayalalPachaiyappa," Vector Calculus", Muhil Publishers, 2009.   [Unit III &IV].

3. G. Balaji, " Transforms and Partial Differential Equations", G. Balaji Publishers, 2014.   [Unit V]

Contents:

Unit I	Chapter-3	Page Number	: 61-66, 77-83,
	Chapter-4	Page Number	: 93-105.
Unit II	Chapter-5	Page Number	: 122 -141.
Unit III	Chapter-1,2,3	Page Number	: 1-65.
Unit IV	Chapter-5&6	Page Number	: 98-204.
Unit V	Chapter-2	Page Number	: 2.1-2.46, 2.120-2.144.

Reference Books:

1. Kandasamy. P, Thilagavathi. K, " Mathematics for B.Sc. Branch I", Volume I II and IV - S.Chand and Company Ltd, New Delhi, 2004.

2. P.Duraipandian and LaxmiDuraipandian, " Vector Analysis", Emerald Publishers, 2003.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M	M			H	
CO2	L	H		M	M				H
CO3	L	H			M		M		
CO4	L	H	L			H	M		
CO5	L	H	L		M		M		
CO6		H				H			H

Semester II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA2CP	Core Practical - Trig World	2	0	0	3	Practical

Introduction: This paper enables the students to learn its application into wider fields like engineering, physics, surveyors, architects, astronauts and even in the investigation of a crime scene.

Course Outcome:

CO1	:	Examine the concept of trigonometric equations, triangles, and applications.
CO2	:	Demonstrate the concept of several trigonometric identities and use them to verify other identities.
CO3	:	Evaluate trigonometric and inverse trigonometric functions.
CO4	:	Determine gradient vector fields and find potential functions
CO5	:	Apply Fourier analysis to half range series.

1. How to find Measure Height of a building or a mountain?

2. How trigonometry used in Aviation?

3. How trigonometry used in marine engineering?

4. How do engineers use trigonometry?

5. How is trigonometry used in construction?

6. How is trigonometry used in architecture?

7. How is trigonometry used in oceanography?

8. How is trigonometry used in astronomy?

9. What is the use of Sin Cos Tan in real life?

10. How trigonometry is used in navigation?

11. Explain the applications of trigonometry in Criminology?

12. A 200 feet long zipline cable is attached to the top of a tree and extends to an anchor on the ground. The cable makes an angle of 61 degree with the ground. Calculate how far away the foot of the cable is to the base of the tree.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M	M			H	
CO2	L	H		M	M				H
CO3	L	H			M		M		
CO4	L	H	L			H	M		
CO5	L	H	L		M		M		

Semester III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA3CA	Core - V – Statics	4	6	0	0	Theory

Introduction: This paper enables the students to learn about the nature of forces acting on a surface, friction and centre of gravity.

Course Outcome:

CO1	:	Recall the concept of forces and its related applications.
CO2	:	Demonstrate the method to resolve forces and to find the resultant of forces.
CO3	:	Experiment the fundamental concepts of statics with respect to real life mechanism.
CO4	:	Deduce the resultant of coplanar forces in different planes.
CO5	:	Examine the concept of couples and parallel forces in different systems.
CO6	:	Develop the understanding of the concepts in Statics for further learning of Mechanics.

Unit I:

Introduction - Forces - types of Forces - Equilibrium of two forces - Forces acting at a point - Parallelogram law of forces - Analytical expression for resultant of two forces acting at a point- triangle law of forces- Perpendicular triangle law of forces- Converse of the Triangle law of forces - The polygon law of forces - Lami's theorem - Simple problems.

Unit II:

Resolution of forces - components of a force along two given directions- Theorem on resolved parts- Resultant of any number of forces acting at a point- Resultant of any number of coplanar forces acting at a point - Conditions of Equilibrium of any number of forces acting upon a particle- Simple problems.

Unit III:

Parallel forces &Moments : Introduction- The resultant of two like parallel forces acting on a rigid body- The resultant of two unlike & unequal parallel forces acting on a rigid body- Resultant of a number of parallel forces acting on a rigid body - Moment of a force - Geometrical representation of a moment - sign of the moment - unit of moment - Varigon's theorem of Moments.

Unit IV:

Couples- Equilibrium of two couples - Equivalence of two couples - Couples in parallel planes - Resultant of coplanar couples - Resultant of a couple and a force - Simple problems.

Unit V:

Coplanar forces - Reduction of any number of coplanar forces - Conditions for a system of forces to reduce to a single force or to a couple- Equation to the line of action of the resultant .

Text Book

1. Dr. M.K.Venkataraman, Statics, Agasthiar Publications, Trichy,15th edition, 2012.

Contents:

Unit-I   : Chapter 2   : sections 2.1 - 2.10
Unit-II   : Chapter 2   : sections 2.11-2.16
Unit-III   : Chapter 3   : sections 3.1-3.4, 3.7, 3.9-3.12
Unit-IV   : Chapter 4   : sections 4.1- 4.10
Unit-V   : Chapter 5   : sections 5.1, 5.3, 5.5, 5.8, 5.9

References Book

1. A.V.Dharmapadam, Statics, S.Viswanathan Printers and Publishing Pvt., Ltd, 2011.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M		M	H	
CO2	L	H	L		M			H	
CO3	L	H		M			M	H	H
CO4	L				M	H			
CO5	L				M				
CO6			L	M		H			H

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA3CP	Core Practical - Experimental Statics	2	0	0	3	Practical

Introduction: This paper is to develop the ability to visualize problem formulation and the construction of of a meaningful mathematical model to experience the concepts in real life.

Course Outcome:

CO1	:	Apply the concept of forces and its related applications.
CO2	:	Demonstrate the method to resolve forces and to find the resultant of forces.
CO3	:	Experiment the fundamental concepts of statics with respect to real life mechanism.
CO4	:	Analyze the concept of resultant of coplanar forces in different planes.
CO5	:	Examine the concept of couples and parallel forces in different systems.

1. Find the application of parallelogram law and make it as a model?

2. Create a chart to demonstrate the application of Lami's theorem?

3. A 15 kg mass is supported by a thin cord attached to a hook in the ceiling. Another cord is attached to the ring of the mass and pulled horizontally until the supporting cord makes an angle of 30° with the vertical. Find the tensions in both strings.

4. A small block of weight 150 N is placed on an inclined plane which makes an angle, $\theta = 30°$ with the horizontal. What is the component of this weight parallel to inclined plane and perpendicular to inclined plane?

5. A computer base unit of mass 6 kg is dragged along a smooth desk. If the tension in each arm of the person dragging it is 20 N and it acts at 25° above the horizontal, what is the acceleration of the base unit and what is its normal reaction?

6. A uniform rod is of length 4 m and mss 8kg and from its extremities are suspended masses of 4kg and 12kg respectively from what point must the rod be suspended so that it may remain in a horizontal position.

7. Create a model to establish the concept of couples in parallel planes?

8. Demonstrate how Varignon's theorem is used to find the moment. Make it as a model?

9. The four coplanar forces are acting at a point. Determine the resultant in magnitude and direction analytically and graphically?

10. Determine the resultant couple moment acting on the beam?

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	PO9
CO1	L	H			M		M		H
CO2	L	H	L		M				H
CO3	L	H		M			M		H
CO4	L				M	H			
CO5	L				M				

Semester IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA4CA	Core - VII Modern Algebra	4	6	0	0	Theory

Introduction: This paper provides the knowledge about Groups, Rings, Ideals, Matrices, vector spaces and linear transformations.

Course Outcome:

CO1	:	Recall the concept of sets, groups and its properties.
CO2	:	Understand the basic concepts of Normal and Quotient groups.
CO3	:	Examine the types of Automorphisms by their properties.
CO4	:	Apply the concept of Rings.
CO5	:	Evaluate the concept of More Ideals and Quotient Rings.
CO6	:	Discuss the concept of Sets and Rings.

Unit I:
Set theory - Mappings - Definition of a Group - Some Examples of Groups - Some preliminary Lemmas - Subgroups.

Unit II:
A Counting principle - Normal Subgroups and Quotient Groups - Homomorphisms.

Unit III:
Automorphisms - Cayley's Theorem - Permutation Groups.

Unit IV:
Definition and Examples of Rings - Some Special Classes of Rings - Homomorphism - Ideals and Quotient Rings.

Unit V:
More Ideals and Quotient Rings - The Field of Quotients of an Integral Domain - Euclidean Rings - A Particular Euclidean Ring.

Text Book:
I.N. Herstein, Topics in Algebra, second edition, John Wiley & Sons, New York, 2005.

Contents:
Unit-I   : Chapter 1 Sections : 1.1, 1.2, Chapter 2 Sections : 2.1 - 2.4.
Unit-II : Chapter 2 Sections : 2.5 - 2.7.
Unit-III : Chapter 2 Sections : 2.8 - 2.10.
Unit-IV : Chapter 3 Sections : 3.1 - 3.4.
Unit-V : Chapter 3 Sections : 3.5 - 3.8

Reference Books:
1.Surjeet Singh and Qazi Zameeruddin, Modern Algebra, Vikas Publishing house, 8 th edition 2006.
2. Seymour Lipschutz and Marc Lipson, Linear Algebra, 3rd Edition, McGraw Hill, 2012.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**PO9**
CO1	L		L		M		M		
CO2	L		L						
CO3				M	M		M		
CO4				M	M		M		
CO5		H				H	M	H	H
CO6		H			M			H	H

Semester IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA4CP	Core Practical – Actual Algebra	2	0	0	3	Practical

Introduction: This paper provides the real life application about Rings, Ideals, Matrices, vector spaces and linear transformations.

Course Outcome:

CO1	:	Compare the concept of sets, groups and its properties.
CO2	:	Analyze the basic concepts of Groups.
CO3	:	Examine the types of Rings by their properties.
CO4	:	Determine the concept of Matrices and its types.
CO5	:	Apply the concept of vector space in Transformation.

1. Chart work on types of algebraic structures.

2. Chart work on Applications of symmetric group in molecular system.

3. Chart work on history of Ring Theory.

4. Make a model for cancellation law.

5. Demonstrate the application of Matrices and their inverse matrices in coding or encrypting a message.

6. Demonstrate the Cayley- Hamilton Theorem.

7. Collect the models for application of vector space in Nature(Fractals)

8. Chart work on application of vector space in search engines.

9. Make a model for linear transformation.

10. Chart work on linear transformation in Image processing.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**PO9**
CO1	L		L		M		M		
CO2	L		L						
CO3				M	M		M		
CO4				M	M		M		
CO5		H				H	M	H	H

Semester V

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA5CA	Core IX- Real Analysis – I	4	6	0	0	Theory

Introduction: This paper enables the students to learn about the basic concepts of Real Analysis and obtain a foundation for the further study in analysis.

Course Outcome:

CO1	:	Recall the basic concepts of Real and Complex number Systems.
CO2	:	Understand the concept of Set theory, Relations and Functions.
CO3	:	Apply the concept of intersection theorem and covering theorems.
CO4	:	Compare the concept of continuity, convergent sequences and metric space.
CO5	:	Evaluate the concept of Limits and Continuity to solve the problems.
CO6	:	Discuss the fundamental properties of the real numbers that lead to the formal development of real analysis.

Unit I:
The Real and Complex number Systems: Introduction - The field axioms - The order axioms– Geometric representation of real numbers-Intervals - Integers - The unique factorization theorem for integers - Rational numbers - Irrational numbers - Upper bounds, maximum element, least upper bound - The completeness axiom - Some properties of the supremum - Properties of the integers deduced from the completeness axiom -The Archimedean property of the real number system- Absolute values and the triangle inequality - The Cauchy Schwarz inequality - Plus and minus infinity and the extended real number system R^*.

Unit II:
Some Basic Notations of Set Theory: Ordered pairs - Cartesian product of two sets - Relations and functions - One to one functions and inverses - Composite functions - Sequences -Similar sets - Finite and infinite sets - Countable and uncountable sets – Uncountability of the real number system - Set algebra - Countable collections of countable sets.

Unit III:
Elements of Point Set Topology: Euclidean space R^n - Open balls and open sets in R^n - The structure of open sets in R^1 - Closed sets - Adherent points, Accumulation points - Closed sets and adherent points - The Bolzano-Weierstrass theorem - The Cantor intersection theorem – Lindelof covering theorem - The Heine-Borel covering theorem - Compactness in R^n .

Unit IV:
Elements of Point Set Topology: Metric spaces - Point set topology in metric spaces - Compact subsets of a metric space - Boundary of a set.
Limits and Continuity: Convergent sequences in a metric space - Cauchy sequences - Complete metric spaces - Limit of a function - Limits of vector valued functions.

Unit V:
Limits and Continuity: Continuous function - Continuity of composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued functions - Monotonic functions.

Text Book:

1.Tom M. Apostal, "Mathematical Analysis", Addison Wesley, Second Edition, 2002.

Contents:

    Unit I   - Chapter 1 Sections: 1.1 - 1.20 (Except 1.15 - 1.17).

    Unit II   -   Chapter 2 Sections: 2.3 - 2.15 (Except 2.6).

    Unit III - Chapter 3 Sections: 3.2 - 3.12.

    Unit IV - Chapter 3 Sections: 3.13 - 3.16,

                Chapter 4 Sections : 4.2 - 4.5, 4.7.

    Unit V - Chapter 4 Sections: 4.8, 4.9, 4.12, 4.16, 4.19, 4.20, 4.22, 4.23.

Reference Books :

1.Ralp P. Boas, A primer of Real function, The mathematical Association of America, 1960.

2.Walter Rudin, Principles of Mathematical Analysis, Third EditionMcGraw Hill Inter Editions, 1976.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L		M	H			
CO2			L	M					
CO3	L				M				H
CO4							M		
CO5	L			M				H	
CO6		H				H			H

Semester V

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA5CP	Core Practical – Real Applications	2	0	0	3	Practical

Introduction: The main aim of this paper is intended to explore the basic ideas of Real Analysis so as to understand the concepts deeper which supports further research.

Course Outcome:

CO1	:	Analyze the basic concepts of Real and Complex number Systems.
CO2	:	Examine the concept of Set theory, Relations and Functions.
CO3	:	Apply the concept of intersection theorem and covering theorems.
CO4	:	Compare the concept of continuity, convergent sequences and metric space.
CO5	:	Evaluate the concept of Limits and Continuity to solve the problems

1. i) Does the ordered field of rational functions satisfy the Archimedean axiom?

    ii) Prove that if an ordered field satisfies the completeness theorem, then the Archimedean axiom holds?

2. Explain the concepts of supremum and infimum and model it as a chart?

3. Create a model to distinguish countable and uncountability of real numbers?

4. Demonstrate the applications of sequences and series as a model?

5. Prepare a chart/model to visualize the concept of open ball, interior point, adherent point and accumulation points?

6. Demonstrate the application of Bolzano Weierstrass theorem using real life examples?

7. Explain or model Lindelof covering theorem with real life examples?

8. Prepare a chart to show the characteristics of Heine Borel theorem?

9. Form a table or chart to explain the concept of spaces and its properties?

10. Demonstrate the concept of limits and continuity with real applications?

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L		M	H			
CO2			L	M				H	
CO3	L				M				H
CO4		H					M		
CO5	L			M				H	

Semester VI

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA6CA	Core XII- Real Analysis – II	4	7	0	0	Theory

Introduction: This paper enables the students to learn about basic concepts of Real Analysis which is a foundation for further study in analysis.

Course Outcome:

CO1	:	Recall the Properties of Derivatives and Continuity.
CO2	:	Understand the concept of bounded variations and its properties.
CO3	:	Examine the concept of functions and continuous functions.
CO4	:	Apply the concept of Riemamm- Stieltjes integral and derive conclusions.
CO5	:	Prove the theorems by using the properties of Riemann integral.
CO6	:	Discuss the fundamental properties of the real numbers that lead to the formal development of real analysis.

Unit I:
Derivatives: Introduction - Definition of derivative – Derivatives and continuity - Algebra of Derivatives – The chain rule – One sided Derivatives and infinite derivatives -Functions with nonzero derivative – Zero derivatives and local extrema - Rolle's theorem - The Mean Value Theorem for derivatives –Intermediate value theorem for derivatives - Taylor's formula with remainder.

Unit II:
Functions of Bounded Variations: Introduction - Properties of monotonic functions - Functions of bounded variations - Total variations - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation

Unit III:
The Riemann-Stieltjes Integral: Introduction - Notation - The definition of Riemann-Stieltjes Integral - Linear properties - Integration by parts - Change of variable in Riemann-Stieltjes integral - Reduction to a Riemann integral - Step functions as integrators - Reduction of a Riemann-Stieltjes integral to a finite sum - Euler's summation formula.

Unit IV:
The Riemann-Stieltjes Integral: Monotonically increasing integrators - Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems - Integrators of bounded variation - Sufficient conditions for existence of Riemann-Stieltjes integrals - Necessary conditions for existence of Riemann- Stieltjes integrals.

Unit V:
The Riemann-Stieltjes Integral: Mean Value Theorems for Riemann-Stieltjes Integrals - The integral as a function of the interval - Second fundamental theorem of integral calculus - Change of variable in a Riemann integral - Second Mean-Value Theorem for Riemann integrals.

Text Book:

1.Tom M. Apostal, Mathematical Analysis, Addison Wesley, Second Edition 2002.

Contents:

           Unit I   -   Chapter 5: Sections: 5.1 to 5.12.
           Unit II   -   Chapter 6 :Sections: 6.1 to 6.8.
           Unit III   -   Chapter 7 :Sections: 7.1 to 7.10
           Unit IV   -   Chapter 7: Sections: 7.11 to 7.17.
           Unit V   -   Chapter 7 Sections: 7.18 to 7.22.

Reference Books:

1. Goldberg R. R, "Methods of Real Analysis", Oxford and IBH Publishing Co., 1973.
2.Soma Sundaram D, Choudhary B, "A first course in Mathematical Analysis", Narosa Publishing House, 1996.
3.Walter Rudin, "Principles of Mathematical Analysis", McGraw Hill Inc, Third Edition, 1976.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L				M		M		
CO2		H		M			M	H	
CO3	L	H				H		H	
CO4	L		L		M				H
CO5	L	H				H	M		
CO6		H				H			H

Semester VI

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMA6CP	Core Practical – Exploring Complexity	2	0	0	3	Practical

Introduction: This paper enables the students to learn about the real life application of Rings, Ideals, Matrices, vector spaces and linear transformations.

Course Outcome:

CO1	:	Compare the Properties of Derivatives and Continuity.
CO2	:	Analyze the concept of bounded variations and its properties.
CO3	:	Examine the concept of functions and continuous functions.
CO4	:	Apply the concept of Riemamm- Stieltjes integral and derive conclusions.
CO5	:	Determine the theorems by using the properties of Riemann integral.

1. Make a model for convex and concave.

2. Demonstrate the Mean value theorem,

3. Chart work on Image recovery using functions of bounded variation.

4. Chart work on types of functions

5. Chart work on application of Riemann-Stieltjes Integral in population growth.

6. Demonstrate the Euler's summation formula.

7. Chart work on to show the upper and lower Riemann integrals of a function.

8. Demonstrate the comparison theorem.

9. Make a model to compare the first and second fundamental theorem of integral calculus.

10. Demonstrate the second mean value theorem.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L				M		M		
CO2		H		M			M	H	
CO3	L	H				H		H	
CO4	L		L		M				H
CO5	L	H				H	M		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACO1	Calculus and Laplace Transforms	4	5	0	0	Theory

Introduction: This paper presents the idea of differential equations, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.

Course Outcome:

CO1	:	Define fundamental concepts and principles of calculus.
CO2	:	Apply the concept of PDE to solve first order equation.
CO3	:	Compare the concepts of differential and integral calculus to solve multiple integrals.
CO4	:	Classify beta and gamma functions with respect to change in double integrals.
CO5	:	Examine the properties of Laplace transformation with application.
CO6	:	Discuss the Mathematical Idea to communicate effectively to the needy with the help of Scientific method of analysis.

Unit I:
Linear differential equations with constant coefficients - Differential equation of higher order - Methods of finding particular integral - Linear differential equations with variable coefficients.

Unit II:
Derivation of partial differential equations by elimination of arbitrary constants and arbitrary functions -Integrals of partial differential equations - Standard types of first order equations - Lagrange's equation

Unit III:
Multiple integrals – Definition and evaluation of double integral - Double integral in Cartesian and polar co-ordinates - Triple integrals.

Unit IV:
Change of variables in double integrals- Jacobian - Transformation from Cartesian to polar co-ordinates -Spherical polar co-ordinates - Beta and Gamma functions – Simple applications to multiple integrals.

Unit V:
Laplace Transforms – Inverse Laplace Transforms- Definition - Transform of f(t), e^{at}, cos at, sin at and t^n when n is an integer – Laplace transforms to solve ordinary differential equation with constant coefficients.

Textbook:

1. Narayanan S. and Manicavachagom Pillay T. K, Calculus Volume - II, S. Viswanathan Pvt. Ltd, 2010.
2. Narayanan S. and Manicavachagom Pillay T. K, Calculus Volume - III,S. Viswanathan Pvt. Ltd, 2010.

Contents:

   Unit I: Chapter 2: Sections 1,4 & 8. (Text Book 2)
   Unit II: Chapter 4: Sections 1-6. (Text Book 1)
   Unit III: Chapter 5: Sections 1-4. (Text Book 2)
   Unit IV: Chapter 6: Sections 1.1,1.2,2.1-2.4. (Text Book 2)
       Chapter 7: Sections 2.1-6 (Text Book 2)
   Unit V: Chapter 5: Sections 1,2,4,5,6,7&8. (Text Book 1)

Reference Books:
1. P. Kandasamy & K.Thilagavathy, "Mathematics for BSc – Vol I and. II" S.Chand and Co-2004.
2. G.B. Thomas, R.L.Finney, "Calculus and Analytical Geometry,"6th edition, Narasa Publication House, New Delhi-1984
3. S.T. Tan, "Applied calculus," 5th edition, Tamson Learning-2002.
4. N.P. Bali, "Interal Calculus," Laximi Publication, New Delhi.
5. Thomas, "Calculus," 11th edition, Dorling Kindersley india Pvt.Ltd-2008

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1		H	L	M		H		H	
CO2		H		M		H		H	
CO3	L			M		H		H	
CO4	L			M		H	M	H	
CO5		H		M	M		M		
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP1	Thinking Calculus-Practical	2	0	0	3	Practical

Introduction: This paper enables the students to applt the concept of differential equations, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.

Course Outcome:

CO1	:	Analyze the fundamental concepts and principles of calculus
CO2	:	Apply the concept of PDE to solve first order equation
CO3	:	Compare the concepts of differential and integral calculus to solve multiple integrals
CO4	:	Create beta and gamma functions with respect to change in double integrals
CO5	:	Examine the properties of Laplace transformation with application

1. There were 100 flies after the second day of the experiment and 300 flies after the fourth day. Approximately how many flies were in the original population**?**

2. Suppose a bacteria population grows at a rate proportional to the   population. There were 200 bacteria 3 days ago and 1000 bacteria 1 day ago. How many bacteria will there be by tomorrow?

3. The population of a town was 60,000 in 1990 and had increased to 63,000 by 2000.Assuming that the population is increasing at a rate proportional to its size at any time; estimate the population in 2010 giving your answer to the nearest hundred.

4. A Patient is receiving drug treatment. When first measured, there is 0.5 mg of the drug per liter of blood. After 4 hours, there is only 0.1 mg per litre. Assuming the amount in the blood at time t is decreasing in proportion to the amount present at time t, find how long it takes for there to be only 0.05 mg. Give the answer to the nearest minute.

5. The town of Coimbatore is growing at a 1.5% population rate. In the year 2016 it had 6200 residents. How many people will there be in 24 years?

6. The United States has a population growth rate of 0.7%.If there were 321 million people in the year 2015, when will there be 400 million people in the United States?

7. The half life of uranium-232 is 68.9 years. How much of a 100-gram sample is presents after 250 years?

8. Describe about Newton's law of cooling?

9. Write about the applications of Integration in Real life?
10. Explain the Applications of Laplace Transform in Science and Engineering fields?

11. How Laplace transforms involved in Nuclear physics?

12. Why do we use Laplace Transform?

13. How is calculus is used in everyday life?

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1		H	L	M		H		H	
CO2		H		M		H		H	
CO3	L			M		H		H	
CO4	L			M		H	M	H	
CO5		H		M	M		M		L

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC02	Analytical Geometry	4	5	0	0	Theory

Introduction: This paper gives emphasis to enhance student knowledge in two dimensional and three Dimensional analytical geometry.

Course Outcome:

CO1	:	Understand the basic concept of Geometry in a practical way.
CO2	:	Understand the differences of 2D and 3D geometrical shapes.
CO3	:	Examine the relationship between Cone and Cylinder.
CO4	:	Construct the models based on Sphere, Cone and Cylinder
CO5	:	Apply the concepts of Sphere, Cone and Cylinder in real world.
CO6	:	Develop problem solving techniques using analytical geometry to diverse situations in mathematical contexts.

Unit I:
Analytical geometry of 2D-Polar Equations -directrix- chord tangent- normal- Problems.

Unit II:
Analytical Geometry 3D-straight lines-co planarity of straight-line-shortest distance (S.D) and equation of S.D between two lines.

Unit III:
Sphere: standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere- equation of a circle.

Unit IV:
Cone and cylinder: Cone whose vertex is at the origin- envelope cone of a sphere-right circular cone.

Unit V:
Cylinder : Equation of a cylinder- Enveloping cylinder - right circular cylinder

Textbook:
1. P. DuraiPandian&KayalalPachaiyappa, "Analytical Geometry 2D" year of publication, Emrald Publishers, Chennai. 2009.[Unit I].

2. P. DuraiPandian&KayalalPachaiyappa, "Analytical Geometry 3D"year of publication,Emrald Publishers, Chennai. 2009. [Unit II to Unit V].

Reference Book:

1. T.K. M. Pillai and Others "Analytical Geometry of 2D "– Viswanathan Publications- 2010

2. T.K. M. Pillai and Others "Analytical Geometry of 3D" – Viswanathan Publications- 2009

3. ShanitNarayan "Analytical Solid Geometry", S.Chand& Company Publication-1983.

4. P. Krishnamurthy, "Analytical Geometry and Calculus vol 2", 1st edition, K.V. Publication- 1995

5. G.B. Thomas, R.L.Finney, "Calculus and Analytical Geometry", 6th edition, Narasa Publication House, New Delhi-1984

Contents

UNIT I   CHAPTER-10section 10.1 – 10.8
UNIT II   CHAPTER-4section 4.1-4.2, 4.6,4.8,4.9,4.12
UNIT III   CHAPTER-5section   5.1-5.2,5.4
UNIT IV   CHAPTER-6 section   6.1,6.2,6.3,6.5
UNIT V   CHAPTER-6section   6.6,6.7

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L		M				
CO2		H	L	M	M	H	M		
CO3		H	L		M				
CO4	L		L	M	M				
CO5			L		M			H	
CO6		H			M		M		H

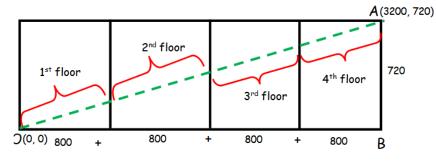| Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP2	Geometry with 2D and 3D-Pr|	2	0	0	3	Practical

Introduction: This paper gives emphasis to enhance student knowledge in two dimensional and three Dimensional geometry with practical exposures.

Course Outcome:

CO1	:	Analyze the basic concept of Geometry in a practical way.
CO2	:	Compare the differences of 2D and 3D geometrical shapes.
CO3	:	Examine the relationship between Cone and Cylinder.
CO4	:	Construct the models based on Sphere, Cone and Cylinder
CO5	:	Apply the concepts of Sphere, Cone and Cylinder in real world.

1. Write about the Real world applications of Analytical Geometry?
2. Where do we see shapes in our everyday lives?
3. Chart different types of two dimensional shapes.
4. Construct a three-dimensional shape using toothpicks and modeling clay,
5. A family is using Liquefied petroleum gas (LPG) of weight 14.2 kg for consumption. (Full weight 29.5 kg includes the empty cylinders tare weight of 15.3 kg.). If it is use with constant rate then it lasts for 24 days. Then the new cylinder is replaced (i) Find the equation relating the quantity of gas in the cylinder to the days.
6. In a shopping mall there is a hall of cuboid shape with dimension 800 × 800 × 720 units, which needs to be added the facility of an escalator in the path as shown by the dotted line in the figure. Find (i) the minimum total length of the escalator. (ii) the heights at which the escalator changes its direction. (iii) the slopes of the escalator at the turning points.

7. How could you make the two-dimensional figure into a three-dimensional figure?

8. Explain Geometry involves in Indian Architecture with examples.

9. Write about the relationship between Cone and Cylinder.

10. How does GPS rely on Geometry?

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L		M				
CO2		H	L	M	M	H	M		
CO3		H	L		M				
CO4	L		L	M	M				
CO5			L		M			H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC03	Differential Equations	4	6	0	0	Theory

Introduction: This paper presents the method of solving ordinary differential Equations of First Order, Second Order and Partial Differential equations.

Course Outcome:

CO1	:	Recall the Algebraic equations and its types.
CO2	:	Construct the Differential equations by using the rules with arbitrary constants.
CO3	:	Develop first order higher degree equations.
CO4	:	Compare the effectiveness of Ordinary differential equations and Partial differential equations.
CO5	:	Choose suitable method to examine the values of x,y,p with respect to the solvable Differential Equations.
C06	:	Develop problem solving techniques using differential equations.

Unit I:

Differential Equations and their formation- Solution of differential equation - Rules to form the differential equation from a given equation is x and y containing arbitrary constants- Simple problems.

Unit II:

First order higher degree equations- solvable for x, y, p- Clairaut's form - Simultaneous equations $F_1(D)x + F_2(D)y = F(t)$ and $G_1(D)x + G_2(D)y = G(t)$ F_1,F_2,G_1,G_2 are rational functions of $D = d/dt$ and F,G are explicit functions of t.

Unit III:

Ordinary differential equations: General solution of Second order ODE with constant coefficients - Higher order equations.

Unit IV:

Partial differential equations: Formation by elimination of arbitrary constants and arbitrary functions - General, particular and complete solutions.

Partial differential equations :Singular and general solutions of first order equations the standard form: $f(p, q) = 0$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$, $f(x, p,) = g(y, q)$, $z = p(x) + q(y) + f(p, q)$ and Lagrange's method of solving linear PDE $Pp + Qq = R$.

Unit V:

Homogeneous Linear Equation - Introduction – Reduction of the Homogeneous linear Equation into linear equation - with constant co-efficient - Simple problems

Text book

1. N.P.Bali, Differential Equations, Lakshmi Publications Ltd, New Delhi, 10th edition,2006
      (Units I, II, III and V).
2.P. Kandasamy, K. Thilagavathi, Mathematics for B. Sc - Branch – I, Volume III, S. Chand and Company Ltd, New Delhi, 2004. (Unit III, IV).

Contents:

        Unit I   - Chapter 1,   Page no: 1-20
        UnitII   - Chapter 7   Page no: 326-355,
                        -Chapter 9   Page no: 400-428
        Unit III   - Chapter 1   Page no: 16-40
        Unit IV   - Chapter 2   Page no: 117-162
        UnitV   - Chapter 5   Page no: 286-308

References Books:

1.T. Veerarajan, Transforms and Partial differential equations, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2nd reprint, 2012.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	PO9
CO1	L					H		H	
CO2		H	L		M	H			
CO3	L	H	L		M	H			
CO4		H	L	M	M	H			
CO5		H	L	M	M		M	H	
CO6		H		M			M		H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP3	Applicable Derivatives - Practical	2	0	0	3	Practical

Introduction: This paper presents the method of solving ordinary differential Equations of First Order and Second Order, Partial Differential equations.

Course Outcome:

CO1	:	Analyze the fundamental concepts of differential equation.
CO2	:	Design first and second order higher degree equations.
CO3	:	Compare the concepts of ODE, PDE and Homogeneous linear equation.
CO4	:	Examine the real life applications of ODE & PDE.
CO5	:	Apply the fundamental concepts of Homogeneous linear equation.

1. Application of Differential equation in Exponential Growth – Population
2. Application of Differential equation in Exponential Decay - Radioactive Material
3. Application of Differential equation in Falling Object
4. Application of Differential equation in Newton's Law of Cooling
5. Application of Differential equation in RL circuit
6. Create the model for application of Differential equation in AI
7. Chart work for application of Differential equation in engineering field
8. Chart work for application of Differential equation in Medicine field
9. Chart work for application of Differential equation in Economical
10. Chart work for application of Differential equation in Fluid and aero dynamics.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	PO9
CO1	L					H		H	
CO2		H	L		M	H			
CO3	L	H	L		M	H			
CO4		H	L	M	M	H			
CO5		H	L	M	M		M	H	H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC04	Dynamics	4	6	0	0	Theory

Introduction: This paper provides the knowledge about the field Kinematics, projectile, simple harmonic motion and impact of a particle on a surface.

Course Outcome:

CO1	:	Remember the basic concepts of Kinematics.	]
CO2	:	Understand the concept of Acceleration.	!
CO3	:	Examine the relationship between mass and weight and solve problems.	(
CO4	:	Discuss the concept of projectile and its characteristics.	]
CO5	:	Apply the concept of impulsive forces to derive conclusions.	!
CO6	:	Develop problem solving techniques using analytical geometry to diverse situations in mathematical contexts.	] (

Unit I:
Kinematics: Velocity - Parallelogram law of velocity - Components of a velocity along two given directions - Triangle law of a velocities –Polygon law of velocities - Relative Velocity - Angular Velocity of a particle moving along a circle with uniform speed- Angular Velocity of a particle moving along any curve- Simple Problems.

Unit II:
Acceleration - Parallelogram law of Acceleration - Motion in a straight line under uniform acceleration - The equations of motion of a particle under constant acceleration - Acceleration of falling bodies - Vertical motion under gravity - Bodies freely falling down ward - Motion of a particle down a smooth include plane - The law of motion- Newton's law of motion- Simple problems

Unit III:
Weight - difference between mass & weight – conservation linear momentum – force of friction – Motion of a particle on a rough horizontal plane under the action of a constant force – Pressure of a body resting on an moving horizontal plane – simple problems – Moment of Inertia – Uniform rod – Rectangular lamina – Uniform Rectangular Parallelopiped of edges 2a,2b,2c – Simple problems.

Unit IV:
Projectiles: Path of   a projectile is a parabola- Characteristics of the motion of a projectile - Horizontal range of a projectile is maximum - velocity of the projectile in magnitude and direction at the end of time t - Simple problems.

Unit V:

Impulsive force - Impact   of two bodies - Loss of Kinetic energy in impact - motion of   a shot & gun- Impact of water on surface - Simple problems

Text book

1. M.K. Venkataraman, Dynamics, 14th Edition, Agasthiar   Publications, Trichy, 2011.

Contents:

Unit-I   :   Chapter 3: sections 3.3, 3.4, 3.6, 3.7,3.8, 3.10 – 3.13
Unit-II   :   Chapter 3: sections 3.17, 3.20, 3.22, 3.28, 3.29, 3.30, 3.31, 3.32
Chapter 4: sections 4.1 & 4.3
Unit-III : Chapter 4: sections 4.8, 4.10, 4.11, 4.13, 4.14, 4.16
                 Chapter 12: sections 12.1, 12.4
Unit-IV : Chapter 6: sections 6.2, 6.4, 6.5, 6.7 & 6.9
Unit-V : Chapter 7: sections 7.2 – 7.6

References Books

1. A.V.Dharamapadam , Dynamics, S.Viswanathan Printers and Publishers Pvt., Ltd, Chennai,
   1st edition, 2011.
2. K.ViswanathaNaik and M.S.Kasi, Dynamics, Emerald Publishers, 2004.
3. Naryanamurthi, Dynamics, National Publishers, New Delhi, 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M			M	H	
CO2		H		M	M			H	
CO3		H		M	M	H		H	
CO4		H	L		M				
CO5		H			M			H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP4	Experimental Dynamics- Practical	2	0	0	3	Practical

Introduction: This paper enables the students to gain fundamental knowledge by using concepts of dynamics in real life problems.

Course Outcome:

CO1	:	Analyze the basic concept of Kinematics.
CO2	:	Determine the concept of Acceleration.
CO3	:	Examine the relationship between mass and weight and solve problems.
CO4	:	Demonstrate the concept of projectile and its characteristics.
CO5	:	Apply the concept of impulsive forces to derive conclusions.

1. To Verification of Triangle law & Parallelogram law of forces.
2. To Verification of polygon law of forces.
3. Determination of Motion of a particle.
4. Determination of Mechanism of flight.
5. Verification of Newton's laws of motion.
6. Determination of moment of inertia of a flywheel.
7. Identify some real life application about Projectiles.
8. List out the Application of Impulsive force.
9. Find out Kinetic energy in real life.
10. Chart work for motion of a shot & gun.
11. Determination of Impact of water on surface.
12. To find the location of center of mass and the moment of inertia of a given connecting rod.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	PO9
CO1	L	H		M			M	H	
CO2		H		M	M			H	
CO3		H		M	M	H		H	
CO4		H	L		M				
CO5		H			M			H	H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC05	Fuzzy Mathematics	4	6	0	0	Theory

Introduction:

This paper provides the knowledge about fuzzy set theory, algebraic concepts and various properties of fuzzy invariance subspaces.

Course Outcome:

CO1	:	Understand the basic concepts of fuzzy set and its properties.
CO2	:	Compare the differences and similarities between fuzzy sets and classical sets theories.
CO3	:	Examine the concept of relations and logic connectives.
CO4	:	Understand the concept of fuzzy subgroup.
CO5	:	Understand the concept of fuzzy invariant subspaces.
CO6	:	Discuss and develop new technologies so as to improve computing facility to maintain environment sustainability.

Unit I :
Introduction- Fuzzy subsets-Lattices and Boolean Algebras- L fuzzy sets-operations on fuzzy subsets – α level sets – properties of fuzzy subsets of a set.

Unit II :
Algebraic product and sum of two fuzzy subsets-properties satisfied by Addition and product-cartesian product of fuzzy subsets.

Unit III:
Introduction- Algebra of fuzzy relations-logic-connectives.

Unit IV :
Connectives- Introduction-fuzzy subgroup - homomorphic image and Pre-image of subgroupoid.

Unit V :
Fuzzy invariant subgroups-fuzzy subrings.

Text book:
1. S.Nanda and N.R.Das "Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi,2012.

Contents:
Unit I   Chapter 1 Sections: 1.1,1.2, 1.4,1.5,1.7,1.9,1.10.
Unit II Chapter 1 Sections: 1.11-1.13.
Unit III Chapter 2 Sections: 2.1-2.4.
Unit IV Chapter 2 Sections: 2.5.
          Chapter 3 Sections: 3.1-3.
Unit V Chapter 3 Sections: 3.4,3.5.

Reference Books:

1.George J.Klir and Tina A. Folger, Fuzzy sets, "Uncertainty and Information", Prentice –Hall of India Private Ltd-Fourth printing –June 1995.

2. H.J.Zimbermann, "Fuzzy Set Theory and its Applications", Allied Publishers Ltd, 1991.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	P09
CO1	L	H		M				H	
CO2	L			M		H			
CO3		H	L		M		M	H	
CO4		H			M	H			
CO5	L		L	M				H	
CO6		H				H	M		H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP5	Frizzy Logic-Practical	2	0	0	3	Practical

Introduction:

This course provides the knowledge about applying concepts such as fuzzy set theory, algebraic concepts and various properties of fuzzy invariance subspaces in practical problems and real world phenomena.

Course Outcome:

CO1	:	Analyze the role of fuzzy set and its properties in real life phenomena.
CO2	:	Experiment with algebraic concept and Cartesian product of fuzzy subsets.
CO3	:	Examine the concept of relations and logic connectives.
CO4	:	Construct a mathematical model with the concept fuzzy subgroup.
CO5	:	Apply the concept of fuzzy invariant subspaces in real life phenomena.

1. Find out the cylindrical extension of $R^{(2)}$.

2. Give an example for a reflexive transitive relation and verify whether it is perfect fuzzy order relation.

3. Construct a fuzzy inventory model using fuzzy techniques

4. Determine the intersections and unions of the following fuzzy sets:

    $\tilde{A}$= {(2, .4), (3, .6), (4, .8), (5, 1), (6, .8), (7, .6), (8, .4)}

    $\tilde{B}$= {(2, .4), (4, .8), (5, 1), (7, .6)}

5. Model the following expressions as fuzzy sets:

    a. Large integers
    b. Very small numbers
    c. Medium-sized men
    d. Numbers approximately between 10 and 20
    e. High speeds for racing cars.

6. Identify application of fuzzy logic in facial pattern recognition.

7. Construct a model for new product pricing using fuzzy sets.

8. List out application of fuzzy ideals in medical diagnosis system.

9. List out application of fuzzy techniques in home appliances.

10. Identify application of fuzzy logic in traffic signal.

11. Construct a economic model using fuzzy logic.

12. List out application of fuzzy logic in forensics and computer security.

Text book:

1. S.Nanda and N.R.Das "Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi,2012.

Reference Books:

1.George J.Klir and Tina A. Folger, Fuzzy sets, "Uncertainty and Information", Prentice –Hall of India Private Ltd-Fourth printing –June 1995.

2. H.J.Zimbermann, "Fuzzy Set Theory and its Applications", Allied Publishers Ltd, 1991.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	P09
CO1	L	H		M				H	
CO2	L			M		H			
CO3		H	L		M		M	H	
CO4		H			M	H			
CO5	L		L	M				H	H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC07	Complex Analysis	4	6	0	0	Theory

Introduction: This paper provides the knowledge about complex number system, complex functions and their properties.

Course Outcome:

CO1	:	Remember the fundamental concept of complex number system and basic operations.
CO2	:	Understand the concept of geometric representation in complex numbers.
CO3	:	Examine the concept of analytic and rational functions in suitable case.
CO4	:	Construct the theorems using power series and convergence.
CO5	:	Apply the concepts of exponential and trigonometric functions.
CO6	:	Develop problem solving techniques using complex analysis to diverse situations in mathematical contexts.

Unit I:

The Algebra of Complex Numbers: Arithmetic operations - Square Roots – Justification - Conjugation, Absolute Value - Inequalities.

Unit II:

The Geometric Representation of Complex Numbers: Geometric Addition and Multiplication - The Binomial Equation - Analytic Geometry - The Spherical Representation.

Unit III:

Introduction to the Concept of Analytic Function: Limits and Continuity - Analytic functions - Polynomials - Rational Functions.

Unit IV:

Elementary Theory of Power Series: Sequences - Series - Uniform Convergence – Power Series - Abel's Limit Theorem.

Unit V:

The Exponential and Trigonometric functions: The Exponential - The Trigonometric functions - The Periodicity - The Logarithm.

Text book:

1. Lars V.Ahlfors, "Complex Analysis" , McGRAW HILL International Editions

   3rd Edition, 1979.

Contents:

Unit I   - Chapter 1: Sections 1.1 - 1.5.

Unit II   - Chapter 1: Sections 2.1 - 2.4.

Unit III   - Chapter 2: Sections 1.1 - 1.4.

Unit IV   - Chapter 2: Sections 2.1 - 2.5.

Unit V   - Chapter 2: Sections 3.1 - 3.4.

Reference books:

1. Ruel V. Churchill and others, "Complex Variables and Applications", Mc Graw Hill 3rd, edition, 1974.
2. E.G. Philips, "Functions of a Complex Variable", Longman Group Limited, 1957.
3. R.P. Boas, "Invitation to Complex Analysis" , Random house, Newyork, 1987.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M					
CO2		H				H		H	
CO3		H				H	M	H	
CO4	L		L	M	M				
CO5		H		M	M	H			
CO6		H	L	M				H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP7	Complex Analysis-Practical	2	0	0	3	Practical

Introduction: This paper provides the knowledge about complex number system, complex functions and their properties.

Course Outcome:

CO1	:	Analyze the fundamental concepts of complex number system and basic operations.
CO2	:	Demonstrate the concept of geometric representation in complex numbers
CO3	:	Examine the concepts of analytic and rational functions in suitable case
CO4	:	Construct the theorems using power series and convergence
CO5	:	Apply the concepts of exponential and trigonometric functions.

1. Explain the history of complex numbers?

2. Discuss about Fractal?

3. Make a model for fast Multipole Method?

4. How is complex Analysis is used in Video games?

5. What are the applications of complex Analysis in Nuclear Engineering?

6. Explain the origin of complex Analysis?

7. What are the complex numbers used for in real life?

8. How are complex numbers used in engineering?

9. Why are complex numbers needed?

10. Where do we use Complex Analysis in real life?

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	P09
CO1	L	H		M					
CO2		H				H		H	
CO3		H				H	M	H	
CO4	L		L	M	M				
CO5		H		M	M	H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC08	Abstract Algebra	4	6	0	0	Theory

Introduction: This paper enables the students to learn about groups, subgroups, Rings and Maximal and Prime Ideals.

Course Outcome:

CO1	:	Recall fundamental concept of sets and groups
CO2	:	Examine the concept of cyclic groups and langrage's theorem
CO3	:	Estimates the properties of isomorphism and homomorphism
CO4	:	Estimates the concept of rings and properties of rings by some definition and examples
CO5	:	Describe facts of Maximal and Prime Ideals
CO6	:	Discuss the use of Mathematical concepts and to develop further the ability to understand and produce proofs in an algebraic context.

Unit I:
Groups : Definition and Examples – Elementary Properties of a Group – Equivalent Definitions of a Group.-Permutation Groups

Unit II:
Subgroups - Cyclic Groups-Order of an Element – Cosets and Lagrange's Theorem .

Unit III:
Normal Subgroups and Quotient Groups - Isomorphism –Homomorphism

Unit IV:
Rings: Definitions and Examples - Elementary properties of rings –Isomorphism - Types of rings.-Characteristic of a ring – subrings – Ideals - Quotient rings

Unit V:
Maximal and Prime Ideals.-Homomorphism of rings – Field of quotient of an integral domain – unique factorization domain-Euclidean domain

Textbook:
   1. S Arumugam and AThangapandi Isaac, Modern Algebra, SciTech Publications, Chennai, 2003.
Contents:
        Unit I   : Chapter 3 Sections 3.1-3.4
        Unit II   : Chapter 3 Sections3.5-3.8
        Unit III : Chapter 3 Sections 3.9-3.11
        Unit IV   : Chapter 4 Sections 4.1-4.8
        Unit V   : Chapter 4 Sections 4.9- 4.11, 4.13-14

Reference Books:

1. N. Herstein, Topics in Algebra, John Wiley & Sons, Student 2nd edition, 1975.

2. Vijay, K. Khanna and S.K. Bhambri, A Course in Abstract Algebra, Vikas Publishing House Pvt. Ltd.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**PO9**
CO1	L		L						
CO2	L		L		M			H	
CO3	L		L		M			H	
CO4	L		L	M				H	
CO5		H		M			M		
CO6		H				H		H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP8	Abstract Algebra Practical	2	0	0	3	Practical

Introduction: This paper enables the students to learn about groups, subgroups, Rings and Maximal and Prime Ideals.

Course Outcome:

CO1	:	Apply the fundamental concept of sets and groups
CO2	:	Examine the concept of cyclic groups and langrage's theorem
CO3	:	Analyze the properties of isomorphism and homomorphism
CO4	:	Estimate the concept of rings and properties of rings by some definition and examples
CO5	:	Discover the facts of Maximal and Prime Ideals

1)Show that if $(G, \cdot)$ is a group of order 9, then G is abelian

2)Let $\sigma = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 8 & 4 & 3 & 2 & 7 & 6 & 1 \end{bmatrix}$ and $\tau = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 5 & 2 & 7 & 8 & 1 & 6 & 4 \end{bmatrix}$

   a)Write τ as a product of cycles

   b) Write σ as a product of transpostions.

   c) Compute $\sigma\tau$ and $\tau\sigma$.

   d) What is the order of σ? of $\sigma\tau$?

3) What are the limitations of group theory in the prediction of vibrational modes?

4) Application abstract algebra used in physics

5) How algebra used in economic level?

6) Explain about permutations of Rubik's Cube have a group structure?

7) How Ring used in Cryptography?

   8) How is ring theory used in physics?

9) What are the real world application of finite group theory?

10) Application of the ring theory in the segmentation of digital images

11) Application of semirings in decision making ?

12) A Brief History of Algebra with a Focus on the Distributive Law and Semiring Theory.

Textbook:

1.S. Arumugam and AThangapandi Isaac, Modern Algebra, SciTech Publications, Chennai, 2003.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**PO9**
CO1	L		L						
CO2	L		L		M			H	
CO3	L		L		M			H	
CO4	L		L	M				H	
CO5		H		M			M		H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC09	Number Theory	4	6	0	0	Theory

Introduction: This course enables the students to understand the concepts of fundamental theorems, Permutation and Combinations, Congruences, Primitive roots and their basic properties.

Course Outcome:

CO1	:	Recall the concepts of divisibility and linear Diophantine equations.
CO2	:	Apply the concept of permutations and combinations in deriving theorems.
CO3	:	Make use of properties of congruence in theorems.
CO4	:	Examine the concept of multiplicative functions.
CO5	:	Develop new methods to solve unsolved problems about primes.
CO6	:	Explain the need of number theoretic concepts underlie almost all of the encryption methods used for a large variety of important security measures.

Unit –I:
Basic Representation: Principles of Mathematical induction - The Basis Representation Theorem. The Fundamental Theorem of Arithmetic: Euclid's Division Lemma - Divisibility - The linear Diophantine Equation - The Fundamental Theorem of Arithmetic.

Unit –II:
Combinational and Computational Number Theory: Permutations and Combinations- Fermat's Little Theorem (Statement only) - Wilson's Theorem (Statement only). Fundamentals of Congruences: Basic properties of Congruences- Residue systems.

Unit –III:
Solving Congruences: Linear congruences - the theorems of Fermat and Wilson Revisited - The Chinese Remainder theorem - Polynomial congruences .

Unit –IV:
Arithmetic Functions: Combinatorial study of $\emptyset(n)$ - Formulae for d(n) and $\emptyset(n)$ - Multiplicative arithmetic functions - The Mobius Inversion Formula.

Unit –V:

Primitive Roots: Properties of Reduced Residue Systems - Primitive Roots Modulo P. Prime Numbers: Elementary properties of $\emptyset(x)$ – Tchebyshev's theorem - Some unsolved problems about primes.

Text Book:
1. George E. Andrews, "Number Theory", HPS (India), 1992.

Contents:

         Unit 1 - Chapter 1 and 2.
         Unit II - Chapter 3: Sections: 3.1 - 3.3,
                  Chapter 4 :Sections: 4.1, 4.2.
         Unit III - Chapter 5.
         Unit IV - Chapter 6.
         Unit V - Chapter 7 and 8.

Reference Books:

1. David M. Burten, "Elementary Number Theory", McGraw- Hill, 1997.

2. Kumaravelu et al., "Elements of Number Theory", Nagerkovil, SKV, 2002.

3. Telang, "Number theory", Tata McGraw-Hill publishing Company Ltd, 1984.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H		H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP9	Number Theory Practical	2	0	0	3	Practical

Introduction: This course enables the students to understand the concepts of fundamental theorems, Permutation and Combinations, Congruence, Primitive roots and their basic properties.

Course Outcome:

CO1	:	Apply the concepts of divisibility and linear Diophantine equations.
CO2	:	Evaluate the concept of permutations and combinations in defined theorems.
CO3	:	Examine the properties of congruence in theorems.
CO4	:	Apply the concept of multiplicative functions.
CO5	:	Determine new methods to solve unsolved problems about primes.

1. Prove that $1 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$.

2. Prove that if a and b are odd integers, then $a^2 - b^2$ is divisible by 8.

3. Assume a man pays $1.43 for some apples and pears. If pears cost $17 each and apples, $15 each, how many of each did he apply?

4. Constructing 4 persons in 5 chairs is a permutation.

5. Prove that a set S of n elements precisely 2^n subsets (the empty set and S itself are counted as subsets).

6. Find integers x such that
   a. $5x \equiv 4 \ (mod \ 3)$
   b. $7x \equiv 6 \ (mod \ 5)$
   c. $9x \equiv 8 \ (mod \ 7)$

7. Solve $x^3 + 3x^2 - 4 \equiv 0$ (mod175).

8. Evaluate $\varphi(19)$, $\varphi(49)$, $\varphi(243)$ and $\varphi(1024)$.

9. Construct a table of induces of all integers for m = 17 and g = 3.

10. Find the prime factorization of 2, 432, 902, 008, 176, 640, 000 = 20!.

11. How many primitive roots exist for the module 6,7,8,9 and 10.

12. Prove that if n≠m, then g.c.d (φ_n, φ_m) = 1.

Text Book:

1. George E. Andrews, "Number Theory", HPS (India), 1992.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC10	Linear Algebra	4	6	0	0	Theory

Introduction: This course enables the students to understand the concept of Vector spaces, linear equations and linear transformations.

Course Outcome:

CO1	:	Explain the basic concepts of Vector spaces.
CO2	:	Examine the concept of linear transformations and its characteristics.
CO3	:	Understand the concept of Inner product space.
CO4	:	Demonstrate the concept of determinants.
CO5	:	Make use of the concept of determinants and developing knowledge about diagonalization.
CO6	:	Develop the concept of linear algebra to develop ethical and legal environment.

Unit I:

Vector Spaces: Definitions and Examples- Vector Subspaces-Basics and dimension of a vector spaces- Quotient spaces

Unit II:

Linear Transformations: Linear Transformations-Representatives of a linear maps and matrices-Kernal and image transformations-Some special linear transformations

Unit III:

Inner product space: Orthogonality - Orthonormal basis-Orthogonal complements and projections- Orthogonal transformation.

Unit IV:

Determinants: 2 X 2 determinants as area of a parallelogram- Determinants and properties-Computation of determinants- Basics results on determinants.

Unit V:

Determinants: Orientations and vector product.

Diagnolization: Eigen values and Eigen Vectors- Diagonalization of symmetric matrices

Text Book:

1. S.Kumaresan, "Linear Algebra", Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2017.

Contents:
Unit I :   Chapter 2 and 3.
Unit II :   Chapter 4.
Unit III: Chapter 5: Sections: 5.2,5.5,5.6,5.8.
Unit IV: Chapter 6: Sections:6.1,6.2,6.3,6.4.
Unit V: Chapter 6: Sections: 6.5, Chapter 7: 7.2, 7.3.

Reference Books:

1. B. S. Vatssa," Theory of matrices", Willey Eastern Limited, 1995.
2. I.N. Herstein," Topics in algebra", John Wiley Son (ASIA) Pvt Ltd,Second Edition, 2004.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L	M				H	
CO2		H		M	M	H		H	
CO3	L		L			H	M		
CO4	L	H			M				
CO5	L			M	M		M	H	
CO6		H	L		M			H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP10	Linear Algebra-Practical	2	0	0	3	Practical

Introduction: This course enables the students to apply the concept of Vector spaces, linear equations, linear transformations and determinants.

Course Outcome:

CO1	:	Apply basic properties of Vector spaces.
CO2	:	Examine the characteristics of linear transformation in real life phenomena
CO3	:	Compare the applications of matrix and determinants.
CO4	:	Determine the properties of inner product space.
CO5	:	Analyze the properties of diagonalisation to construct a mathematical model.

1. Write $(0, -26, -9)$ as a linear combination of $(5, 3, 7)$ and $(2, -4, 1)$. Show that $(1, 3, 5)$ cannot be written as a linear combination of these two vectors.

2. If $\{u, v\}$ is a basis for the subspace U, then show that $\{u + 2v, -3v\}$ is also a basis for U

3. For each of the following transformations, determine the kernel and the range and whether the transformation is one-to-one and/or onto.

    a. $T : R2 \rightarrow R2$, $T(x, y) = (2x - 3y, 5x + y)$.

    b. $T : R2 \rightarrow R2$, $T(x, y) = (8x + 4y, 2x + y)$.

    c. $T : R3 \rightarrow R2$, $T(x, y, z) = (x - y, y - z)$.

    d. $T : R2 \rightarrow R3$, $T(x, y) = (2x - 3y, 5x + y, y$

4. If A is an m × n matrix and the linear system Ax = b has at least one solution for every vector b in R^m, what is the range of $T_A : R^n \rightarrow R^m$.

5. suppose that L is one-to-one. Show that ker L $= \{0_V\}$. That is, show that 0_V is in ker L, and then show that there are no other vectors in ker L.

6. Consider the space of polynomials given by V = span $\{1, x\}$ with inner product $\langle p, p' \rangle = \int_0^1 p(x)p'(x)dx$. Check whether it is orthonormal or not.

7. For which values of a does $span\left\{ \begin{pmatrix} 1 \\ 0 \\ a \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}, \begin{pmatrix} a \\ 1 \\ 0 \end{pmatrix} \right\} = \mathbb{R}^3$?

8. Identify the role of linear transformation in the rotation of rigid body in two dimensions.

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9. List out application of inner product space in boundary value problem.

10. Let M be a matrix and $S_i^j M$ the same matrix with rows i and j switched. Explain every line of the series of equations proving that det M = $-\det(S_i^j M)$.

11. Diagonalize the matrix $M = \begin{pmatrix} -14 & -28 & -44 \\ -7 & -14 & -23 \\ 9 & 18 & 29 \end{pmatrix}$.

12. Let $= \begin{pmatrix} 2 & 1 \\ 0 & 2 \end{pmatrix}$. Find all eigenvalues of M. Does M have two linearly independent eigenvectors? Is there a basis in which the matrix of M is diagonal?

Text Book:

1. S.Kumaresan, "Linear Algebra", Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2017.

Reference Books:

1. B. S. Vatssa," Theory of matrices", Willey Eastern Limited, 1995.
2. I.N. Herstein," Topics in algebra", John Wiley Son (ASIA) Pvt Ltd,Second Edition, 2004.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	P09
CO1	L		L	M				H	
CO2		H		M	M	H		H	
CO3	L		L			H	M		
CO4	L	H			M				
CO5	L			M	M		M	H	H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAC11	Group theory	4	6	0	0	Theory

Introduction: This course provides knowledge about groups, subgroups, cyclic groups, normal subgroups, homeomorphisms and isomorphism.

Course Outcome:

CO1	:	Recall the basic concepts of Set theory.
CO2	:	Understand the concepts of groups and its types.
CO3	:	Examine the concepts of permutation and its properties.
CO4	:	Apply the concept of normal subgroups and factor groups.
CO5	:	Compare the theorems on Homomorphism.
CO6	:	Develop the knowledge about group theory and its problem solving technique.

Unit I:
Groups: Definition and Examples of Groups – Elementary Properties of Groups - Finite Groups- Order of a Group, order of an Element with examples

Unit II:
Subgroup, Subgroup Tests and Examples - Center of a Group – Centralizer of a in G – Cyclic Groups - Definition and Examples, Fundamental Theorem of Cyclic Groups- Problems related to cyclic groups.

Unit III:
Permutation Groups: Definition and Examples – Cycle Notation – Properties of Permutations – Isomorphism : Definition and Examples – Cayley's Theorem - Properties of Isomorphisms (statements only)- Automorphisms, Inner Automorphism with some examples

Unit IV:
Cosets and Lagrange's Theorem - Normal Subgroups and Factor Groups -Applications of Factor Groups (theorems with proof only)

Unit V:
Group Homomorphisms - Properties of Homomorphisms - The First Isomorphism Theorem – sylows theorems (statements only) with related problems (maximum five only).

Text Book:
1. Joseph A. Gallian, "Contemporary Abstract Algebra", eighth edition.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L		L					H	
CO3	L		L				M	H	
CO4		H			M			H	
CO5			L	M	M			H	
CO6		H				H			H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMACP11	Group theory - Practical	2	0	0	3	Practical

Introduction: This course provides knowledge about groups, subgroups, cyclic groups, normal subgroups, homeomorphisms and isomorphism.

Course Outcome:

CO1	:	Analyze the basic concepts of Set theory.
CO2	:	Determine the concepts of groups and its types.
CO3	:	Examine the concepts of permutation and its properties.
CO4	:	Apply the concept of normal subgroups and factor groups.
CO5	:	Compare the theorems on Homomorphism.

1. Identify symbols of identity in molecule or object.

2. Find out n-fold rotations of H_2O

3. Calculate reflection: σ (the symmetry element is called a mirror plane or plane of symmetry)

4. Calculate inversion: i (the element that corresponds to this operation is a center of symmetry or inversion center.

5. Simplify n-fold rotation followed by reflection through mirror plane perpendicular to rotation axis

6. Calculate group multiplication table for H_2O

7. Classification of the symmetry of molecules.

8. Define point groups with working examples

9. Finding the rotation of car wheels using mattress group

10. solving of rubik's cube puzzle.

11. pattern generation using graphic design

12. Determine mechanical engineering: gear assembly.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L		L					H	
CO3	L		L				M	H	
CO4		H			M			H	
CO5			L	M	M			H	H

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAA07	Statistics for Mathematics– I	4	5	0	0	Theory

Introduction: This course introduces Statistical concepts that enable the students to understand mathematical aspects of statistics.

Course Outcome:

CO1	:	Recall the Basic Fundamental concepts about various types of data, to construct suitable diagrams.
CO2	:	Apply suitable methods under Measure of Central Tendency to solve the real time applications.
CO3	:	Compare the difference between Correlation and Regression.
CO4	:	Recall the fundamental concepts of Probability.
CO5	:	Apply the Suitable Probability law to solve the Probability Distribution related problems.
CO6	:	Explain the need of Being with ethics of Science while Communicating and producing the results using statistical tools.

Unit I:
Concepts of a statistical population and sample from a population, quantitative and qualitative data, nominal, ordinal and time-series data, discrete and continuous data. Presentation of data by tables and by diagrams, frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods)

Unit II:
Measures of Central tendency – Mean, Median, Mode – simple problems. Measures of Dispersion – Range, Quartile Deviation, Mean Deviation, Standard Deviation

Unit III:
Pearson's correlation co-efficient - Spearman's Rank correlation co-efficient, Regression – concepts - Regression lines - Analysis of Variance - One way and Two way classification.
Unit IV:
Random experiments, trial, sample space, events. Approaches to probability - Classical, empirical, subjective and axiomatic. Addition rules of probability. Conditional probability, independence of events and multiplication rule of probability. Bayes theorem and its applications.

Unit V:
Binomial, Poisson, Normal Probability Distribution – Simple Problems.

Textbook:

1. S.C.Gupta, V.K.Kapoor, Fundamentals of Mathematical statistics , Sultan chand&Sons, Educational Publishers, New Delhi, 2011.
2. S.P.Gupta, Statistical Methods, Sultanchand&Sons, Educational Publishers, New Delhi, 2015.

Contents:

Unit-I	: Chapter 1,3,4,5,6	Text Book II
Unit-II	: Chapter 7,8	Text Book II
Unit-III	: Chapter 10,11 (Volume I),	Chapter 5(Volume II) Text Book II
Unit-IV	: Chapter 3, Sections 3.1	Text Book I
Unit-V	: Chapter 2 (Volume II),	Text Book II

Reference Books:

1. S.C.Gupta, V.K.Kapoor, Fundamentals of Applied Statistics, Educational Publishers, New Delhi, 2012.
2.G.V. Shenoy, V.K. Srivastava and S.C.Sharma, New Age International (Pvt.Ltd) Publishers, New Delhi,2014.
3.R.S. Bhardwaj, Business Statistics, Published by Anurag Jain for Excel books, Second Edition, New Delhi, 2008.
4. N.P. Bali, Statistics (Maths Series), Laxmi Publications pvt.Ltd, New Delhi.
5.D.N. Elhance, Fundamentals of Statistics, KitanMahal Publishers, New Delhi, 2002.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L						M		
CO2		H			M		M		
CO3	L		L	M		H		H	
CO4	L		L				M	H	
CO5			L			H			H
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAA08	Statistics For Mathematics– II	4	5	0	0	Theory

Introduction: This paper introduces Applied Statistical concepts and mathematical Analysis. That enables the students to understand mathematical aspects of applied statistics.

Course Outcome:

CO1	:	Remember the concept of parameters and properties.
CO2	:	Understand the concept of hypothesis testing.
CO3	:	Analyze the variance with one or two way classification.
CO4	:	Apply the testing of significance using various distributions.
CO5	:	Measure the concept of census and sample survey.
C06	:	Develop the problem solving techniques using statistics.

Unit I:

Concepts of parameter, random sample and its likelihood. Properties of estimators - Un biasedness, Efficiency, Consistency and sufficient condition for consistency. Sufficiency, Factorization theorem, CR Inequality

Unit II:

Test of hypothesis: Statistical hypothesis - simple and composite hypothesis, Null and Alternat hypothesis - Sample and Parameter Space – Two Types of errors – Critical Region - Power Test (Conc only). Test of significance - exact tests based on t, chi-square and F distributions - simple applications.

Unit III:

Analysis of variance; one way, two way classifications, Total sum of squares, between sum of squares within sum of squares – Assumptions - ANOVA table.
Elementary ideas on, non - parametric tests – Run, Sign and Mann Whitney U tests – Simple Problems

Unit IV:

Test of Significance - test based on the case– Normal, t, Chi square, f Distributions simple application

Unit V:

Census and Sampling, Principal steps in a sample survey, different types of sampling, Organization a execution of large scale sample surveys, errors in sampling (Sampling and non sampling err preparation of questionnaire, simple random sampling with and without replacement, Systema stratified and cluster sampling (Theory only).

Text Book:

1. S.C.Gupta, V.K.Kapoor, Fundamentals of Mathematical statistics , Sultan chand&Sons, Educational Publishers, New Delhi, 2011.
2. S.P.Gupta, Statistical Methods, Sultanchand&Sons, Educational Publishers, New Delhi, 2015.

Contents:

    Unit-I   : Chapter 17 Sections 17.2.1,17.2.2,17.2.3 Text Book I
    Unit-II   : Chapter 18 Sections 18.1-18.3   Text Book II
    Unit-III   : Chapter   5,11(Volume II), Text Book II
    Unit-IV   : Chapter 3,4,5 (Volume II), Text Book II
    Unit-V   : Chapter 4 (Volume I), Text Book II

Reference Books:

1. S.C.Gupta, V.K.Kapoor, Fundamentals of Applied Statistics, Educational Publishers, New Delhi, 2012.
2. G.V. Shenoy, V.K. Srivastava and S.C.Sharma, New Age International (Pvt.Ltd) Publishers, New Delhi,2014.
3. R.S. Bhardwaj, Business Statistics, Published by Anurag Jain for Excel books, Second Edition, New Delhi, 2008.
4. N.P. Bali, Statistics (Maths Series), Laxmi Publications pvt. Ltd, New Delhi.
5. D.N. Elhance, Fundamentals of Statistics, KitanMahal Publishers, New Delhi, 2002.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L				M		
CO2					M			H	
CO3	L		L	M			M		
CO4	L				M		M		
CO5	L		L		M	H		H	
CO6		H		M			M		H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BPHA01	Physics	4	5	0	0	Theory

Introduction: This paper provides the knowledge about mechanics, properties of matter and sound, thermal physics and also to know about the light, electricity and electromagnetism.

Course Outcome:

CO1	:	Recall the basic concept of Mechanics.
CO2	:	Understand the properties of elasticity.
CO3	:	Analyze the condition for interference.
CO4	:	Apply the concept of thermal physics.
CO5	:	Explain the Law's of electricity .
C06	:	Discuss the concepts of physics and its applications.

Unit I:

Mechanics

Composition of two simple harmonic motions along a line and at right angles – Lissajou's figures, uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks. Projectile - Motion in horizontal plane - Maximum height – Time of flight – Range – to prove the path of the Projectile is a parabola – Range and time of flight in a horizontal plane.

Unit II:

Properties of matter and sound

Elasticity: Elastic constants – Bending of beams – Young's modulus by uniform and non uniform bending – Energy stored in a stretched wire – Torsion in a wire – Determination of rigidify modulus – Torsional oscillation – Static torsion.

Sound: interference of sound waves – Beats – Doppler Effect –Applications – Ultrasonics – Piezoelectric method – Applications.

Unit III:

Condition for interference – Young's double slit experiment – Interference due to transmitted light – Air wedge – Newton's rings **–** Determination ofrefractiveindex of a liquid – Diffraction - Diffraction at a single slit – Transmission grating – Polarization – Production and analysis of circularly and elliptically polarized light – Optical activity – Specific rotation – Half shade polarimeter

Unit IV:

Thermal physics

Specific heat of solids and liquids – Dulong and Petit law – Newton's law of cooling – Thermal conductivity – Lee's disc method – Variation of specific heat with temperature – Vanderwaal's equation of state – derivation of critical constants – Black body radiation – Stefan's law – Laws of thermodynamics – Change of entropy in reversible and irreversible processes.

Unit V:

Current Electricity and Electromagnetism

Kirchhoff's laws – Wheatstone's network – Condition for balance – Carey –Foster's bridge – measurement of resistance – Capacitor – Energy of charged capacitors – Loss of energy due to sharing of charges. Electromagnetic induction - Faraday's laws – AC circuits – Mean – rms – Peak values – LCR in series and in parallel – Sharpness of resonance – Ballistic Galvanometer – Theory – Measurement of capacitance – Transformer and its applications.

Text book

1. R. Murugeshan, "Properties of matter"S.Chand& Company, 2015. (unit 1&2)

2. Brijlal& N.Subramaniam, "Heat and thermodynamics"S.Chand& Company (2006).(unit 3)

3. Brijlal, M.N. Avadhanalu& N. Subramaniam, "A text book of Optics" S.Chand& Company (2015) (unit 4)

4. Brijlal&Subramaniam, "Electricity and magnetism", S.Chand& Company publishers, New Delhi (2004). (unit 5)

References Books

1. D.S.Mathur, "Properties of Matter" Shyamlal Charitable Trust, New Delhi (2010).

2. Singhal, "Heat, Thermodynamics and Statistical mechanics" AgarwalPrakashPragatiPrakashan publisher Meerut (1992) .

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L				M		
CO2					M			H	
CO3	L		L				M		
CO4		H			M				
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCMA03	Principles of Accountancy	4	5	0	0	Theory

Introduction: The paper aims to provide a knowledge about Concepts and conventions of Accounting &Basic Accounting framework.

Course Outcome:

CO1	:	Recall the fundamental concept of accounting.
CO2	:	Understand the concept of accounting information to solve Errors and rectification.
CO3	:	Apply the Bills of exchange and Account current in data.
CO4	:	Analyze the Accounting for consignments and Joint ventures.
CO5	:	Apply the Bank Reconciliation statement and Accounts of professionals.
CO6	:	Develop knowledge on application of accountancy in real life business.

Unit I:
Fundamentals of Book Keeping – Accounting Concepts and Conventions – Journal – Ledger – Subsidiary books – Trial balance.

Unit II:
Final accounts of a sole trader with adjustments – Errors and rectification.

Unit III:
Bills of exchange - Accommodation bills – Average due date – Account current.

Unit IV:
Accounting for consignments and Joint ventures.

Unit V :
Bank Reconciliation statement – Receipts and Payments and income and expenditure account and Balance sheet – Accounts of professionals.

Text Book:
1. 1. N.Vinayakam, P.L.Mani, K.L.Nagarajan – Principles of Accountancy – S.Chand & Company Ltd.,
2. T.S.Grewal – Introduction to Accountancy- S.Chand & Company Ltd.,
3. R.L.Gupta, V.K.Gupta, M.C.Shukla – Financial Accounting – Sultanchand & sons

Reference Books:
1. T.S.Grewal, S.C.Gupta, S.P.Jain – Advanced Accountancy- Sultanchand & sons
2. K.L.Narang, S.N.Maheswari - Advanced Accountancy-Kalyani publishers
3. S.K.Maheswari, T.S.Reddy - Advanced Accountancy-Vikas publishers
4. A.Murthy -Financial Accounting – Margham Publishers
5. P.C.Tulsian - Advanced Accountancy – Tata McGraw Hill Companies.
6. A.Mukherjee, M.Hanif – Modern Accountancy. Vol.1- Tata McGraw Hill Companies

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H			
CO2	L	H	L				M		
CO3		H	L		M			H	
CO4	L		L	M			M		
CO5		H	L		M			H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAA09	Financial Mathematics	4	5	0	0	Theory

Introduction: This course is intended to prepare students to use fundamental ideas about mathematics in solving monetary problems related to learn financial ethics.

CO1	:	Recall the concept of profit and loss, basis of interest.
CO2	:	Explain the suitability of interest and valuations of securities in business situation.
CO3	:	Understand the fundamental concepts of insurance mathematics.
CO4	:	Apply Premium Calculations and Law of Averages and Large numbers.
CO5	:	Examine the concept of various distributions.
CO6	:	Develop the knowledge in students to follow ethics in financial transaction.

Unit I:
Simple interest-Compound interest-Nominal and effective rate of interest.

Unit II:
Present Value- Accumulated value-Future value- Annuities and perpetivity-Monthly installment(EMI Calculations)-Valuations of securities-Stocks and shares.

Unit III:
Probability of survival and death- Life contingencies- Mortality table- Life table.

Unit IV:
Assurance- Annulities(life)- Premium Calculations- Law of Averages and Large numbers.

Unit V:
Loss Distribution-Skewed distribution-Gaussian Distribution- Cauchy distribution-β and γ Distributions.

Text Book:
1. Introduction to Financial Mathematics- Kevin.J. Hashtings-CRC Press-2003

Reference books:
1. Ales Cerny: "Mathematical techniques in Finance: Tools for incomplete markets", Princeton University Press
2. S.R. Pliska, "Introduction to Mathematical Finance: Discrete time models"
3. Karatzas and S. Shreve, "Methods of Mathematical Finance", Springer, New York
4. MarekCapinski and Tomasz Zastawniak, "Mathematics for Finance: An Introduction to Financial Engineering", Springer, London.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H			
CO2	L		L	M				H	
CO3	L		L			H	M	H	
CO4		H			M		M		
CO5	L		L		M		M		
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCSA03	Office Automation	4	5	0	0	Theory

Introduction: This subject deals with Microsoft Word, Microsoft Excel and access so that students will gain basic computer knowledge.

Course Outcome:

CO1	:	Recall the basics of computer language.
CO2	:	Develop skills in windows using , wordpad, notepad etc.
CO3	:	Examine the concept of Microsoft office 2000 and access the knowledge about working in wordpad.
CO4	:	Analyze the available tools to work with excel.
CO5	:	Describe the usage of computers and the essential components in business and society.
CO6	:	Develop the knowledge to work with Microsoft office.

Unit I:

 Windows Operating System: Overview of different version of windows Opening, closing and resizing windows-enlarging-reverting, reducing the windows-basic windows elements-saving, printing file-qutting a program-file and folder-Working in Explorer-opening and closing a folder in Explore-Entertainment-working in paint-working in Wordpad and Notepad-system tools

Unit II:

 Introduction to Microsoft Office 2000-Word Processing & Microsoft Word-Introduction to Word Processing-Some Important Terms of Word ProcessingStarting Word-Microsoft Word Screen-File Menu-Edit Menu-View Menu-Insert MenuFormat Menu Tools Menu-Table Menu-Window Menu-Help Menu-Formatting the TextAlignment of Text-Applying Fonts-Size of Text-Font of the Text-Color of the Text.

Unit III:

 Spreadsheets & Microsoft Excel: Understanding Microsoft Excel for Windows-Starting Microsoft Excel 2000-Understanding Spreadsheets-File Menu-Edit Menu-View Menu-Insert Menu-Format Menu-Tools Menu-Data Menu-Window MenuHelp Menu.

Unit IV:

 Creating a Worksheet in Excel for Windows-Copying Formula-Formulas That Make Decisions-Styles-Functions in Excel-Using Autosum-Using autocalculateReferences-Sum Function-Average Function-Creating Charts in Excel-Creating GraphsModifying Chart-Adding Data to Chart-Add a Data table to a Chart-Add a TrendlineCreating a Pivot Table Report-Modifying the Chart Type.

Unit V:

 Introduction to Tables-Simple Queries-Form.

Text Book:
1. IT Tools and Applications-Vikas Gupta-Dreamtech Press-First edition-2003

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCHA01	Chemistry - I	4	5	0	0	Theory

Introduction: This paper aims to provide the knowledge about Bonding, Dye, Fertilizers, industrial chemistry, Chromatography and Stereoisomerism.

Course Outcome:

CO1	:	Recall the fundamental concepts of Chemical Bonding, fuels and Interhalogen compounds.
CO2	:	Understand the characteristics of Industrial Chemistry, fertilizers.
CO3	:	Apply the Concepts of Covalent bond, Stereoisomerism.
CO4	:	Analyze the concept of Terms and Dyes.
CO5	:	Build the solutions of liquid, Kinetics and Chromatography.
CO6	:	Discuss about the application of Chemistry in Chemical Bonding, Chromatography.

Unit I:
Chemical Bonding: Molecular orbital theory ,bonding, non bonding, anti bonding-molecular orbitals-MO configuration of H_2, N_2, O_2, F_2. Bond order, Diamagnetism and paramagnetism-Diborane:Preparation and properties, structure, preparation and uses of NaHB, Borazole-Chemistry- Interhalogen compounds:ICI,BrF_3,if3-Preparation, properties, hybridization and structure,shape. Basic properties sodium hydrosulphite, peracids of sulphur: preparation, properties and uses, Structure of iodine.

Unit II:
Indusrtial Chemistry: Synthesis, properties and uses of silicones. Fuel gases: natural gas,water gas, semi water gas, carbureted water gas, produces gas, oil gas(manufacturing details not required). Fertilizers urea, ammonium sulphate, ammonium nitrate, potassium nirate, NPK fertilizer, Triple superphosphate. Pollution of air, water and soil-sources, remedies.

Unit III:
Covalent bond: orbital overlap, hybridization, geometry of organic molecules-CH_4,C_2H_4,C_2H_2, C_6H_6. Inductive effect, Electrometric, mesomeric, hyperconjucative and steric effects, Effect in properties of compounds.
Stereoisomerism:
Optical isomerismsymmetry, elements of symmetry, Cause of optical activity, tartaric acid, Racemisation, Resolution. Geometric isomerism of maleic and fumaric acids,Keto-enol tautomerism in Acetoacetic esters.

Unit IV
Terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect.
Dyes: azo and triphenylmethane dyes- Preparation one example

Unit V
Solutions : Types, Liquid in Liquid, Raoult's law,Deviation from ideal behavior,Binary liquid mixture s, Fractional distillation.

Kinetics Rate, order, moleculality, pseudo first order, determination of order.
Measurement of reaction, Effect of temperature on the rate, Energy of activation.
Chromatography Principle and application of column, paper and thin layer chromatography.

Text Book:
1.Dr. V. Veeraiyan.,"Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14,Edition-2008 (Unit-I to Unit-V)

Reference Books:

1 P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand &Sons, New Delhi, 2013.

2. Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCHA02	Chemistry - II	4	5	0	0	Theory

Introduction:

This paper deals with the concept of Metals, Aromatic compounds, Heterocyclic, organic acids and electrochemistry.

Course Outcome:

CO1	:	Recall the fundamental concepts of Metals and Coordination Chemistry, Types of furnaces, Refining and Chelation Examples.
CO2	:	Understand the characteristics of Aromatic Compounds and Heterocyclics.
CO3	:	Apply the Concepts of Amino Acids and Carbohydrates.
CO4	:	Analyze the concept of Energetics.
CO5	:	Build the solutions of Electrochemistry and Phase Equilibria.
CO6	:	Discuss about the application of Chemistry in Metals and Energetics.

Unit I: Metals
General methods of excitation of metals, Types of ores, Methods of ore dressing,
 Types of furnaces,
Reductionn methods, electricalmethods, types of refining Van Arkel Zone refining, Extraction of U.
Coordination Chemistry
Nomenclature, Theories of Werner, Sidge Wick, Pauling, Chelation examples, Haemoglobin, chlorophyll.
 Applications in qualitative and quantitative analysis EDTA.

Unit II: 1.Aromatic Compounds
Electrophilic substitution in benzene mechanism of nitration, halogenation, alkylation, acylation,
 sulphonation, Preparation, propertiesand structural education of naphathalene.
2.**Heterocyclics:**
Preparation and properties of furan, thiophene, pyrrole and pyridine.

Unit III: Amino Acids:
Classification, preparation and properties, preparation of peptides,
Classification of proteins by physical properties.
Carbohydartes: classification, preparation and properties of glucose and fructose,
Discussion of open chain ring structures ofglucose and fructose, Glucose-fructose interconversion.

Unit IV: Energetics:
Definition of first law thermodynamics, Types of sytems, Reversible, irreversible, Isothermal and
 adiabatic processes, Spontaneous processes, JouleThomson effect, Enthalpy, bond energy,
 Need for the second law, Carnot cycle and Carnot theorem, Entropy and its significance,
 Free energy change.

Unit V: Electrochemistry:
Kohlraush's law, Measurement of conductance, pH determination, Conductometric titrations,
Hydrolysis of salts: pH and buffer in living systems, Galvanic cells, e.m.f. standard
electrode potentials, reference electrodes, Electrochemical series, its applications,
Principles of electroplating, pH determination.
Phase Equilibria: Definition of terms in phase rule, Study of a simple eutectic system Pb-Ag.

Text Book :
1.Dr. V. Veeraiyan.,"Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14,Edition-2008(Unit-I to Unit-V).

Reference Books:
1. P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand &Sons, New Delhi, 2013.
2. Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS01	Skill Based Subject Introduction to MATLAB	2	3	0	0	Theory

Introduction: This paper aims to provide basic knowledge in the subject of Matlab, which is one of the important aspects of advanced mathematics.

Course Outcome:

CO1	:	Understand the basics of Matlab and Matlab operations.
CO2	:	Construct data files and formulate the data for plotting the graphs.
CO3	:	Construct the matrices and vectors with the aid of mathematical operators.
CO4	:	Apply the concept of scripts and functions.
CO5	:	Estimate the three dimensional graphs for data values.
CO6	:	Develop the Programming knowledge about MATLAB.

Unit I:
        Starting with matlab: Starting matlab, matlab windows - working in the command window - arithmetic operations with scalars - display formats - elementary math built-in functions - defining scalar variables - useful commands for managing variables -script files - examples of matlab applications.

Unit II:
        Creating arrays: Creating a One-Dimensional Array (Vector) - Creating a Two-Dimensional Array (Matrix) - Notes about Variables n MATLAB - The Transpose Operator - Array Addressing - Using a Colon: In Addressing Arrays - Adding Elements to Existing Variables - Deleting Elements - Built-In Functions for Handling Arrays - Strings and Strings as Variables.

Unit III:
        Mathematical operations with arrays: addition and subtraction – array multiplication - array division - element-by-element operations - using arrays in matlab built-in math functions - built-in functions for analyzing arrays - generation of random numbers - examples of matlab applications.

Unit IV:
        Programming in matlab: Scripts and Functions – Script files – Functions files.

Unit V:
        Plotting: Two-dimensional plots - Three-dimensional plots.

Text Book:
1.MATLAB An Introduction with Applications By AmosGilat. JOHN WILEY & SONS, INC.,2011

Reference Books:
1. William John Palm, "Introduction to Matlab 7 for Engineers" McGraw-Hill Professional, 2005.
2. Dolores M. Etter, David C. Kuncicky, "Introduction to MATLAB 7" Prentice Hall, 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L		M				
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCSS09	Skill Based Subject Programming in C	2	4	0	0	Theory

Introduction: This paper presents the importance of C language, its structure, Data types, Operators of C, Various control statements, Arrays, different types of functions and practical problems.

Course Outcome:

CO1	:	Understand the concept of functional hierarchical code organization.
CO2	:	Define and manage data structures based on problem subject domain.
CO3	:	Understand the concept of decision making amd branching statements.
CO4	:	Apply defensive programming and concept of object thinking within the framework of functional model.
CO5	:	Develop knowledge about textual information, characters and strings.
CO6	:	Discuss about arrays of complex objects and to handle possible errors during program execution.

Unit I:
Overview of C - Introduction - Character set - keyword & Identifiers -Constants - Variables - Data types - Defining Symbolic Constants – Expressions.

Unit II:
Arithmetic operators - Relational operators - logical operators –assignment operators – increment and decrement operates –Conditional operators – Special operators – formatted input and output.

Unit III:
Decision Making and Branching -The Switch statement - The GOTO statement - Decision Making and Looping -The WHILE statement - The DO statement - The FOR statement - Jumps in Loops.

Unit IV:
Functions – User defined functions –function types - Need for user Defined functions – A Multi-function program –Structures

unit V:
Arrays – Character Arrays –– Strings, standard string function - One and Two

Dimensional arrays - Multidimensional arrays.

Text Book:

1. Programming in ANSI C – E.Balagurusamy, 3rd edition– Tata McGraw hill publishing Company Ltd., 2005.

Reference book:

1. Programming with ANSI and Turbo C – Ashok. N. N.Kamthane   – Pearson Education.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS02	Skill Based Subject Mathematica	2	4	0	0	Theory

Introduction: This course provides knowledge about numerical calculations, algebraic equations, math functions and various operations on functions and matrices.

Course Outcome:

CO1	:	Remember the basic concept of Mathematica.
CO2	:	Understand the concept of functions and programs.
CO3	:	Apply advanced mathematics in Mathematica.
CO4	:	Classify the concepts of series, limits and residues.
CO5	:	Explain the numerical operations on data & functions.
C06	:	Discuss the problem solving techniques using mathematics.

Unit I:
Introduction To Mathematica: Running Mathematica - Numerical calculations – Building up calculations – Using the Mathematica system – Algebraic calculations – Symbolic mathematics - Numerical mathematics.

Unit II:
Functions and programs – Lists – Graphics – Input and output in notebooks – The structure of graphics.

Unit III:
Advanced Mathematics In Mathematica: Numbers - Mathematical functions – Algebraic manipulation – Manipulating equations.

Unit IV:
Series, limits and residues - Linear algebra.

Unit V:
Numerical operations on data and functions.

Text Book:
1. S. Wolfram, Mathematica, Fifth Edition, Cambridge University Press, Cambridge, 2003.

Contents:

Unit I   : Chapter 1: Sections 1.0-1.6
Unit II   : Chapter 1: Sections 1.7-1.10
Unit III   : Chapter 3: Sections 3.1-3.4
Unit IV   : Chapter 3: Sections 3.6-3.7
Unit V   : Chapter 3: Sections 3.8-3.9

References Books:

1. David McMahon, Daniel M.Topa, A Beginners guide to Mathematica, Taylor and Francis Publications,1st edition, 2002.
2. Paul Wellin, Programming with Mathematica-An Introduction, Cambridge University Press, 1st edition, 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L						
CO2	L		L				M		
CO3			L		M			H	
CO4	L		L	M					
CO5	L		L	M	M			H	
C06		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCSS10	Skill Based Subject Programming in C++	2	4	0	0	Theory

Introduction: This paper enriches the knowledge of students on the Applicability of OOPs concept with the help of C++.

Course Outcome:

CO1	:	Understand dynamic memory management techniques using pointers, constructors and destructors.
CO2	:	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
CO3	:	Apply inheritance, usage of exception handling, generic programming.
CO4	:	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
CO5	:	Demonstrate the use of various OOPs concepts with the help of programs.
CO6	:	Learn and Discuss about C++ Streams.

Unit I:
OOPS: A New Paradigm – Evaluation of Programming Paradigm – Objects – Classes –– OOPs Languages –Application of OOPs.
Unit II:
Application of C++ - Structure of C++ Program – Tokens, Expression -Basic Data Types – Symbolic Constants – Operator in C++ - Function.
Unit III:
Array of Objects – Friend Function -Pointer to Members –– Operator Overloading and Type Conversions – Overloading – Function Overloading – Special Features of Function Overloading.
Unit IV:
Inheritance – Single Inheritance –public - Private – Protected Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Polymorphism – Virtual Functions
Unit V:
C++ Streams – Stream Classes -Unformatted I/O Operation – Managing Console I/O Operations - Classes for File Stream Operations – Opening and Closing a file.

Text Book:
1. E.Balagurusamy - 'Object Oriented programming with C++', 3rd edition, McGraw Hill Publishing Company Limited, 2006.

Reference Books:

1. Ashok N.Kamthane – 'Object Oriented Programming with ANSI and Turbo C++', Pearson

2. D.Ravichandran, "Programming with C++", Tata McGraw-Hill Publishing CompanyLimited, New Delhi, 2002.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H		M		H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS03	Skill Based Subject - Introduction to Entrepreneurship	2	4	0	0	Theory

Introduction: This paper presents the importance of various government schemes and opportunities for entrepreneurs and to understand the financial ventures for new business.

Course Outcome:

CO1	:	Able to become an ethical entrepreneur and to provide job for others.
CO2	:	Analyze the business environment in order to identify business opportunities.
CO3	:	Forecast the market opportunity through surveys.
CO4	:	Interpret their own business plan and support the entrepreneurs by preparing project plan.
CO5	:	Raise capital by submitting project plan to various financial institutes.
CO6	:	Develop the knowledge about Professional ethics and management techniques

Unit I:
        Basics of Entrepreneurship- classification of Entrepreneurship- Importance of Entrepreneurship- difference between Entrepreneurship and employment – Entrepreneurial skills- current trends.
Unit II :
        Business management skills-Internal skills- Financial management – Operating management – Manpower management – Material and Inventory management.
Unit III:
        Business management skills- External skill – Marketing Management- Sales Management – Business opportunities – Market Survey and Strategy- investment and investors relations- Business Outreach and promotions.
Unit IV:
        Schemes and Funding- Banking – Lending schemes – Government sponsored schemes- MSME credit – MUDRA loan- PMEGP scheme- CGTMSE Scheme- start-up India.
Unit V:
        Business plan preparation: plan format- proposal preparation – business pitching – EDP- Feasibility Report-successful enterprises-case studies.

Reference Books:

1. C.B.Gupta and S.P.Srinivasan, Entrepreneurial Development.

2. S.S. Khanka, Entrepreneurial Development.

3. S. Anil Kumar, Entrepreneurship Development, New Age International, 2008.

4. Website: https://msme.giv.in/all-schemes

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS04	Skill Based Subject - Quantitative Aptitude	2	4	0	0	Theory

Introduction: To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of competitive examinations.

Course Outcome:

CO1	:	Recall the fundamental concepts of mathematics.
CO2	:	Understand the need of critical thinking to improve chance of employ ability.
CO3	:	Apply the concept of measurement and simple interest.
CO4	:	Examine the ability of knowledge in mathematics.
CO5	:	Examine the knowledge in logical reasoning.
CO6	:	Develop problem solving skills and reasoning ability for cracking competitive exams.

Unit I:
Area-Average-Calendar-Chain Rule-Puzzles

Unit II:
Partnership-Percentage-Pipes and Cisterns-Problems on age

Unit III:
Problems on boat and steam-Ratio- Simple Interest-Time and work

Unit IV :
Mental Ability and logical reasoning - Analogy Test- Series Test- Same Class (Odd) Test- Logical Venn Diagram - Syllogism.

Unit V:
Analytical Reasoning-Mirror Images-Water Image(Number Letter Figure)-Completion of Incomplete Pattern-Grouping of Identical figures.

Text Book:

1. Dr. R.S.Aggarwal ," Quantitative Aptitude" , S.Chand, company limited,.

Reference Books:

1. Dr.R.S.Aggarwal ,"A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S.Chand.
2. Edgar Thorpe "Mental ability and Quantitative Aptitude", 2 Edition
3. Hand book on "Mental Ability and Logical Reasoning" by Bharathiar University, Coimbatore.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H		M		H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS05	Skill Based Subject Actuarial Mathematics	2	4	0	0	Theory

Introduction: This paper enables the learners to gain basic knowledge of life table statistics and get an idea of interest and force of mortality.

Course Outcome:

CO1	:	Remember the basics of probability and theory of interest.
CO2	:	Acquire knowledge about computational illustration in splus.
CO3	:	Analyze the comparison of forces of morality.
CO4	:	Examine the knowledge of binomial variables.
CO5	:	Classify some special integrals and rules for manipulating expectations.
C06	:	Develop the practical knowledge on Real life problems.

Unit I:
Basics of Probability and Interest: Probability. Theory of Interest: Variable Interest Rates, Continuous-time Payment Streams.

Unit II:
Interest and Force of Mortality: More on Theory of Interest, Annuities and Actuarial Notation, Loan Amortization and Mortgage Refinancing, Illustration on Mortgage Refinancing. Interest and Force of Mortality: Computational Illustration in Splus, Coupon and Zero Coupon Bonds.

Unit III:
Interest and Force of Mortality: Force of Mortality and Analytical Models, Comparison of Forces of Mortality. Probability and Life tables: Interpreting Force of Mortality, Interpolation Between Integer Ages.

Unit IV:
Binomial variables and Law of Large Numbers, Exact Probabilities, Bounds and Approximations. Simulation of Life Table Data, Expectation for Discrete Random Variables.

Unit V:
Rules for Manipulating Expectations. Some Special Integrals.

Text Book:

1.Eric V. Slud, "Actuarial Mathematics and Life-Table Statistics", Department of Mathematics,

University of Maryland, College Park, 2001.

Contents:

Unit I   - Chapter 1: Sections - 1. 1 - 1.4

Unit II - Chapter 2: Sections - 2.1(2.1.1 - 2.1.5)

Unit III - Chapter 2: Sections - 2.2

         Chapter 3: Sections - 3.1, 3.2

Unit IV – Chapter 3: Sections - 3.3, 3.3.1,3.4, 3.4.1

Unit V   - Chapter 3: Sections - 3.4.2 ,3.5

Reference Books:

1. Charles L. Trowbridge, "Fundamental Concepts of Actuarial Mathematical Science", Actuarial Education and Research Fund, Revised Edition, 1989.

2. Jerry Alan Veeh, "Lecture Notes on Actuarial Mathematics", (e-notes), 2006.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H		M		H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAS06	Skill Based Subject - Numerical Methods	2	4	0	0	Theory

Introduction: This paper helps the students to have an in-depth knowledge of various advanced methods in numerical analysis.

Course Outcome:

CO1	:	Explain the concept of Bisection and Iteration method.
CO2	:	Understand the concept of polynomial interpolation.
CO3	:	Analyze the concept of Newton Forward and Backward interpolation method.
CO4	:	Derive numerical methods for approximating the solution of the problems of algebraic and transcendental equations, ordinary and partial differential equations.
CO5	:	Solve the ordinary differential equations by using the methods like Euler's, Runge Kutta, Modified Euler and Improved Euler.
CO6	:	Develop the practical knowledge on problem solving techniques.

Unit I:

The solution of Numerical Algebraic and Transcendental Equations: Introduction - The Bisection method - The iteration method - The method of false position (Regula Falsi Method) - Newton Raphson method.

Unit II:

Interpolation: Introduction - Linear interpolation - Gregory Newton Forward and Backward interpolation Formula - Equidistant terms with one or more missing values.

Unit III:

Numerical Differentiation: Introduction - Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives - Derivatives using Stirling's formula - Remarks on numerical differentiation - Maxima and minima of a tabulated function.

Unit IV:

Numerical Integration: The Trapezoidal rule - Romberg's method - Simpson's one third rule - Practical applications of Simpson's rule.

Unit V:

Numerical Solution of Ordinary Differential Equations: Euler's method - Improved Euler's method - Modified Euler method - Runge Kutta method - Second order Runge Kutta Method - Higher order Runge Kutta methods.

Text Book:

1. Venkataraman M. K, Numerical Methods in Science and Engineering, The National Publishing Company, Madras, 2009.

Contents:

Unit I   - Chapter 3 Sections : 1 to 5.

Unit II - Chapter 6 Sections : 1 to 5.

Unit III - Chapter 9 Sections : 1 to 6.

Unit IV - Chapter 9 Sections : 8 to10 and 12.

Unit V - Chapter 11 Sections : 10 to 15.

Reference Books:

1. Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

2. K. SankaraRao, Numerical Methods for Scientists and Engineers, PHI Learning Pvt. Ltd, New Delhi, 2011.

3. Curtis F. Gerald, Patrick O. Wheatley, Applied Numerical Analysis, Dorling Kindersley Pvt Ltd, New Delhi, Seventh Edition.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H			M	H			
CO2	L			M	M			H	
CO3	L		L				M	H	
CO4		H		M			M		
CO5	L		L	M				H	
CO6		H		M		H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE01	Elective - Graph Theory	4	4	0	0	Theory

Introduction: This paper enables the students to gain knowledge about graphs, trees, blocks, connectivity, traversibility, planarity and their properties.

Course Outcome:

CO1	:	Recall the fundamental concepts of graph and its types.
CO2	:	Understand the characteristics of operation on graphs, trees and Fundamental circuits.
CO3	:	Apply the Concepts of Spanning Trees in graphs.
CO4	:	Analyze the concept of characterization in graphs.
CO5	:	Build the Matrix Representation of Graphs and Fundamental Circuit.
CO6	:	Discuss about the application of Graph theory in computer science and other fields.

Unit I:
Graph – Applications of graphs- Finite and Infinite graphs – Incidence and Degree – Isolated vertex, Pendant vertex and Null graphs.
Paths and Circuits: Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected and disconnected graphs – Euler graphs.

Unit II:
Operations on Graphs – More on Euler graphs – Hamiltonian Paths and Circuits – Travelling Salesman Problem.
Trees and Fundamental Circuits: Trees – Properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree.

Unit III:
Spanning Trees – Fundamental Circuits – Finding all spanning trees of a graph –
Spanning trees in a weighted graph .
Cut sets and Cut vertices: Cut sets –Properties of a cut set – All cut sets in a graph.

Unit IV:
Fundamental circuits and cut sets – Connectivity and Seperability.
Planar and Dual Graphs: Planar graphs – Kuratowski's two graphs – Representation of a planar graph.

Unit V:
Matrix Representation of Graphs: Incidence Matrix – Circuit Matrix – Fundamental Circuit Matrix and Rank of circuit matrix – Cut set matrix – Relationship among A_f, B_f and C_f – Path matrix.

Text Book:

1. Narsingh Deo, "Graph theory with Application to Engineering and Computer Science", Prentice Hall of India Pvt. Ltd. (2011).

Contents:

        Unit I: Chapter 1: Sections: 1.1- 1.5

                  Chapter 2: Sections: 2.1,2.2, 2.4- 2.6.

        Unit II: Chapter 2: Sections: 2.7-2.10

                  Chapter 3: Sections: 3.1-3.4.

        Unit III: Chapter 3: Sections: 3.7-3.10

                  Chapter 4: Sections: 4.1 -4.3.

        Unit IV: Chapter 4:Sections: 4.4, 4.5.

                  Chapter 5: Sections: 5.2-5.4.

        Unit V: Chapter 7: Sections: 7.1-7.4, 7.6-7.8.

Reference books:

1. R. Balakrishnan and K. Ranganathan, "A Text Book on Graph Theory", Springer Verlog, New York, 2000.
2. R.Gould, "Graph Theory", The Benjamin/ Cummings Publishing Company, Inc., California, 1988.
3. N. Hartsfield and G. Ringel, "Pearls in Graph Theory", Academic Press, 1990.
4. J.A. Bondy and U.S.R. Murty, "Graph Theory with Applications", Macmillan Company, 1976.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L				M	H			
CO2	L	H		M	M			H	
CO3	L		L		M			H	
CO4		H	L		M		M		
CO5	L		L	M				H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE02	Elective - Astronomy	4	4	0	0	Theory

Introduction: This course enable the students to learn about the solar system, its components and interesting facts about the solar system.

Course Outcome:

CO1	:	Recall the concept of solar system and planets.
CO2	:	Understand the concepts of universe and Zodiac.
CO3	:	Apply the mathematical concepts to explore objects in universe.
CO4	:	Analyze the concept of milky way galaxy and constellations.
CO5	:	Develop knowledge about various constellations.
CO6	:	Discuss the astronomical facts and its related properties.

Unit I:

The Solar System: Introduction - The Sun - Mercury - Venus - Mars - Asteroids - Jupiter - Saturn - Uranus - Neptune.

Unit II:

The Solar System: Comets - Meteors - Zodiacal light.

Unit III:

Double And Multiple Stars: Introduction - Variables stars - Eclipsing Variables Cepheid variables

- Long period variables - Irregular variables - Novae - Star clusters Nebulae - Constellations - Zodiacal Constellations.

Unit IV:

The Milky Way: Introduction - Seasonal changes in the night sky - The winter Constellations

- The spring Constellations.

Unit V:

Constellations: Introduction - The summer Constellations - The autumn Constellations.

Text Book:

1.Kumaravelu S and Susheela Kumaravelu," Astronomy for degree classes", 7th edition 1986.

Contents:

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H		H	
CO2	L	H			M				
CO3	L	H			M		M		
CO4	L		L				M		
CO5		H		M			M		
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE03	Elective - Operations Research –I	4	4	0	0	Theory

Introduction: To enable the students to formulate a real world problem as a mathematical model.

Course Outcome:

CO1	:	Understand the fundamental concepts of Linear Programming Problem.
CO2	:	Apply the concepts of Big M Method and Duality.
CO3	:	Examine the concepts of Transportation problem in a suitable case.
CO4	:	Construct the problems based on Assignment.
CO5	:	Evaluate the problems on Network scheduling.
CO6	:	Develop problem solving techniques using operations research to diverse situations in mathematical contexts.

Unit I:
Basics of O.R – Definition of O.R – Characteristics of O.R - Scientific methods in O.R – Necessary of O.R in Industry – O.R and Decision Making – Scope of O.R in Modern Management – Uses and limitations of O.R. Linear Programming Problem – Formulation of
L.P.P – Graphical solutions of L.P.P – Simplex Method-Problems.

Unit II:
Charnes Penality Method (or) Big – M Method - Duality in L.P.P – Concept of duality – Duality and Simplex Method – Problems

Unit III:
The Transportation Problems – Basic feasible solution by L.C.M – NWC- VAM optimum solutions – unbalanced Transportation problems.

Unit IV:
The Assignment Problems – Assignment algorithm – optimum solutions – Unbalanced Assignment Problems.

Unit V:
Network scheduling by PERT / CPM – Introduction – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM. PERT – PERT calculations – Cost Analysis – Crashing the Network – Problems.

Text Book:
1. Kandiswarup, P. K. Gupta, Man Mohan, "Operations Research", S. Chand & Sons Education Publications, New Delhi, 12th Revised edition

Contents:

Unit I : Chapter 1:Sections:1.1,1.2,1.4,1.6,1.9
              Chapter 2:Sections:2.1,2.2.
              Chapter 3:Sections:3.2.
              Chapter 4: Sections:4.1-4.6.
Unit II : Chapter 5: Sections:5.1-5.6.
Unit III : Chapter10:Sections:10.1-10.8.
Unit IV : Chapter 11:Sections:11.1-11.4.
Unit V : Chapter 25:Sections:25.1-25.8.

Reference Books

1. Prem Kumar Gupta D. S. Hira, "Operations Research", S. Chand & Company Ltd, Ram Nagar, New Delhi.
2. S. Dharani Venkata Krishnan, "Operations Research Principles and Problems", Keerthi publishing house PVT Ltd.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**PO9**
CO1		H		M				H	
CO2	L	H				H			
CO3	L		L	M				H	
CO4		H	L		M				
CO5	L				M	H		H	
CO6		H				H	M		H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE04	Elective - Operations Research –II	4	4	0	0	Theory

Introduction: To enable the students to formulate a real world problem as a mathematical model.

Course Outcome:

CO1	:	Understand the fundamental concepts of Game Theory.
CO2	:	Apply the concepts of Queueing Theory with different models.
CO3	:	Examine the concepts of Inventory control in a suitable case.
CO4	:	Construct the problems based on Simulation.
CO5	:	Evaluate the problems on Decision Analysis.
CO6	:	Develop problem solving techniques using operations research to diverse situations in mathematical contexts.

Unit I:

Game Theory – Two person zero sum game – The Maxmin – Minimax principle – problems Solution of 2 x 2 rectangular Games – Domination Property – (2 x n) and (m x 2) graphical method – Problems.

Unit II:

Queueing Theory – Introduction – Queueing system – Characteristics of Queueing system – symbols and Notation – Classifications of queues – Problems in (M/M/1) : (∞/FIFO); (M/M/1) : (N/FIFO); (M/M/C) : (∞/FIFO); (M/M/C) : (N/FIFO) Models.

Unit III:

Inventory control – Types of inventories – Inventory costs – EOQ Problem with no shortages – Production problem with no shortages – EOQ with shortages – Production problem with shortages – EOQ with price breaks.

Unit IV:

Simulation – Introduction – simulation models – Event – Types of simulation - Generation of Random Numbers – Mante-carlo simulation – simulation of queueing system.

Unit V:

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

Text Book:

1. Kandiswarup, P. K. Gupta, Man Mohan, "Operations Research", S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.

Contents:

Unit I   : Chapter 17: Sections: 17.1-17.11.
Unit II   : Chapter 21: Sections:21.1-21.8.
Unit III :Chapter 19: Sections: 19.1,19.2-19.6,19.10,19.11,19.12.
Unit IV :Chapter 22: Sections: 22.1,22.4-22.7,22.9.
Unit V   :Chapter 16: Sections: 16.1-16.7.

Reference Books:

1. Prem Kumar Gupta D. S. Hira, "Operations Research", S. Chand & Company Ltd, Ram Nagar, New Delhi.

2. S. Dharani Venkata Krishnan, "Operations Research Principles and Problems", Keerthi publishing house PVT Ltd.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	PO2	P03	P04	P05	P06	P07	P08	P09
CO1		H		M				H	
CO2	L	H				H			
CO3	L		L	M				H	
CO4		H	L		M				
CO5	L				M	H		H	
CO6		H				H	M		H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE05	Elective - Discrete Mathematics	4	4	0	0	Theory

Introduction: This paper focuses on the mathematical logic, Relations& Functions, Formal languages and Automata, Lattices and Boolean Algebra and Combinatorics.

Course Outcomes:

CO1	:	Recall the basic concepts of Vector spaces.
CO2	:	Understand the concept of linear transformations and its characteristics.
CO3	:	Building knowledge about Inner product space.
CO4	:	Demonstrate the concept of determinants.
CO5	:	Make use of the concept of determinants and developing knowledge about diagonalization.
CO6	:	Developing the concept of linear algebra to develop ethical and legal environment.

Unit I:

Recurrence Relations and Generating functions: Recurrence - An introduction - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite order Homogeneous (linear) Relations - Solution of Non-homogeneous relations - Generating Functions - Some common recurrence relations.

Unit II:

Logic: Introduction - TF-statements – Connectives - Atomic and Compound Statements - Well Formed (Statement) Formulae -The Truth table of a Formula - Tautology - Tautological Implications and Equivalence of Formulae - Replacement Process - Functionally Complete Sets of Connectives and Duality Law - Normal Forms - Principal Normal Forms.

Unit III:

Lattices and Boolean Algebra: Lattices - Some properties of Lattices -New lattices - Modular and distributive lattices - Boolean Algebras

Unit IV:

Graph Theory: Introduction - Basic Terminology - Paths, Cycles and Connectivity- Subgraphs - Types of Graphs - Isomorpic Graphs - Homeomorphic Graphs – Eulerian and Hamiltonian Graphs.

Unit V:

Language, Grammar and Automata: Introduction - Language - The Set Theory of Strings - Languages - Regular Expressions and Regular Languages - Grammar - Finite-State Machine- Finite State Automata.

Text Book:

1.Sharma J. K," Discrete Mathematics", Macmillan Publishers India Ltd, 2011.

2.Venkataraman M. K, Sridharan N and Chandrasekaran N, "Discrete Mathematics", The National Publishing Company, 2000.

Contents

Unit I   -   Chapter 8 :Sections : 8.1 to 8.8. [Text Book 1]

Unit II -   Chapter 9 :Sections: 1 to 12. [Text Book 1]

Unit III -   Chapter 10 :Sections: 1 to 5. [Text Book 1]

Unit IV -   Chapter 9 :Sections: 9.1 to 9.7 and 9.9. [Text Book 2]

Unit V   -   Chapter 15 :Sections: 15.1 to 15.7. [Text Book 2]

Reference Books:

1.Ralph P. Grimaldi, "Discrete and Combinatoral Mathematics – An applied introduction", Third Edition, Addison Wesley Publishing Company, 1994.

2.Tremblay J. P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 2001.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H		H	
CO2	L	H			M			H	
CO3	L		L	M		H	M		
CO4			L		M			H	
CO5		H		M		H			
CO6		H				H			H

Rathinam College of Arts & Science (Autonomous), Coimbatore-21.
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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE06	Elective - Mathematical modeling	4	4	0	0	Theory

Introduction: This paper helps the students to have brief knowledge about designing the mathematical models in terms of differential equations for given phenomena.

Course Outcome:

CO1	:	Recall the concepts of mathematical modeling in terms of differential equations.
CO2	:	Understand the idea about model design for given problems.
CO3	:	Analyze the procedure for physical phenomena.
CO4	:	Apply the design of models in terms of PDE.
CO5		Examine the various methods for obtain the models.
CO6	:	Discuss about physical problem into mathematical problem in terms of differential equations.

Unit I:

Simple Situations Requiring Mathematical Modeling - The Technique of Mathematical Modeling - Mathematical Modeling Through Differential Equations - Linear Growth and Decay Models - Non-Linear Growth and Decay Models - Compartment Models - Mathematical Modeling of Geometrical Problems Through Ordinary Differential Equations of first Order.

Unit II:

Mathematical Modeling In Population Dynamics - Mathematical Modeling of Epidemics Through Systems of Ordinary Differential Equations of first Order - Compartment Models through Systems of Ordinary Differential Equations - Mathematical Modeling In Economics Through Systems of Ordinary Differential Equations of first Order.

Unit III:

Mathematical Models in Medicine, Arms Race, Battles and International Trade In Terms of Systems of Ordinary Differential Equations - Mathematical Modeling of Planetary Motions - Mathematical Modeling of Circular Motion and Motion of Satellites - Mathematical Modeling through linear differential equations of second order.

Unit IV:

Situation Giving Rise to Partial Differential Equations Models - Mass Balance Equations: First Method of Getting PDE Models - Momentum Balance Equations - The Second Method of Obtaining Partial Differential Models - Variational Principles

Unit V:

Third Function - Fourth Method of Obtaining Partial Differential Equation Models - Models for Tracing of a Highway - Situation that can be modeled through Graphs - Mathematical Models in terms of directed Graphs - Optimization Principles and Techniques - Mathematical Modeling through Calculus of Variations.

Text Book:

1.J.N. Kaptur-Mathematical Modeling,

    Chapters:
      1   (1.1 And 1.2)
      2   (2.1 To 2.4, 2.6)
      3   (3.1 To 3.6)
      4   (4.1 To 4.3)
      6   (6.1 To 6.6)
      7   (7.1 To 7.2)
      9   (9.1 And 9.2)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H			
CO2	L	H			M			H	
CO3	L	H	L			H	M		
CO4	L	H			M			H	
CO5		H				H	M	H	
CO6		H		M		H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE07	Elective - Control Theory	4	4	0	0	Theory

Introduction: This course enables the students to understand about the design of control systems, including classical control theory in the time and frequency domain, Observability, Controllability, Stability, Optimal control.

Course Outcome:

CO1	:	Recall the basic concepts about Linear systems and Observability Grammian.
CO2	:	Understand about the Reconstruction kernel with their Nonlinear Systems.
CO3	:	Build the Controllability Grammian Constant coefficient systems and Adjoint systems.
CO4	:	Apply the concepts of steering function with Nonlinear systems.
CO5	:	Analyze the concept of Asymptotic Stability of Linear Systems with the help of uniform stability.
CO6	:	Develop the concept of Stabilization via linear feedback control, Controllable subspace and Stabilization with restricted feedback.

Unit I :

Observability: Linear Systems – Observability Grammian – Constant coefficient systems – Reconstruction kernel – Nonlinear Systems.

Unit II:

Controllability: Linear systems – Controllability Grammian – Adjoint systems – Constant coefficient systems – steering function – Nonlinear systems.

Unit III:

Stability: Stability – Uniform Stability – Asymptotic Stability of Linear Systems - Linear time varying systems – Perturbed linear systems – Nonlinear systems

Unit IV:

Stabilizability: Stabilization via linear feedback control – Bass method – Controllable subspace – Stabilization with restricted feedback

Unit V:

Optimal control: Linear time varying systems with quadratic performance criteria – Matrix Riccati equation – Linear time invariant systems – Nonlinear Systems.

Text Book:

1. K.Balachandran and J.P.Dauer , "Elements of Control Theory", Narosa, New Delhi, 1999.

Contents:
Unit -I : Chapter 2.
Unit -II : Chapter 3: Sections: (3.1 - 3.3)
Unit - III: Chapter 4.
Unit - IV: Chapter 5.
Unit - V : Chapter 6.

Reference Books

1. R.Conti, "Linear Differential Equations and Control ", Academic Press, London, 1976.
2. R.F.Curtain and A.J.Pritchard, "Functional Analysis and Modern Applied Mathematics", Academic Press, New York, 1977.
3. J.Klamka, "Controllability of Dynamical Systems " , Kluwer Academic Publisher, Dordrecht, 1991.
4. D.L.Russell, "Mathematics of Finite Dimensional Control Systems ", Marcel Dekker, New York, 1979.
5. E.B. Lee and L. Markus, "Foundations of optimal Control Theory ", John Wiley, New York, 1967

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L	H		M				H	
CO2	L		L			H			
CO3		H				H		H	
CO4	L			M				H	
CO5		H			M		M	H	
CO6		H				H			H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BMAE08	Elective - Combinatorics	4	4	0	0	Theory

Introduction: This paper enables the students to understand the concept of permutations, combinations, error correcting codes, block designs and related problems.

Course Outcome:

CO1	:	Recall the basic concepts of permutations and the binomial theorem.
CO2	:	Analyze the pairing problem and assignment problem.
CO3	:	Make use the concept of concurrence and generating functions.
CO4	:	Understand the difference between the exclusion and inclusion principle and related problems.
CO5	:	Discuss the block designs and its applications to error Correcting codes.
CO6	:	Develop the optimal assignment problem and Gale's optimal assignment problem.

Unit I:
Introduction to basic ideas - Selections and Binomial coefficients - Permutations - Ordered selections - Unordered selections - Further remarks on the binomial theorem - Miscellaneous.

Unit II:
Pairings problems: Pairings within a set - Pairings between sets - An optimal assignment problem and Gale's optimal assignment problem.

Unit III:
Concurrence: Some miscellaneous problems - Fibonacci type relations - Using Generating Functions - Miscellaneous methods and Counting simple electrical networks.

Unit IV:
The Inclusion-Exclusion Principle: The Principle - The Rook Polynomials - Steiner Systems and Sphere Packings - Introductory remarks - Steiner Systems S(5,8,24) - Leech's Lattice.

Unit V:
Block Designs and Error correcting codes: Block designs - Square block designs - Hadamard configurations - Error correcting codes.

Text Book:
1. Ian Anderson, "A first course in Combinatorial Mathematics", Oxford University press, 1974.

Contents:
       Unit I : Chapter 1 and 2.
       Unit II : Chapter 3.
       Unit III : Chapter 4.
       Unit IV: Chapter 5 and 7.
       Unit V : Chapter 6.

Reference Books:
1. Balakrishnan V. K and Balakrishnan V,"Schaum's outline of Combinatorics", McGraw Hill Publishers, 1984.
2. Krishnamurthy V, "Combinatorics", Affiliated East West Press Pvt Ltd, New Delhi, 1986.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes								
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**
CO1	L		L			H			
CO2	L	H				H	M		
CO3	L		L		M		M		
CO4				M		H		H	
CO5	L		L		M				
CO6		H				H			H