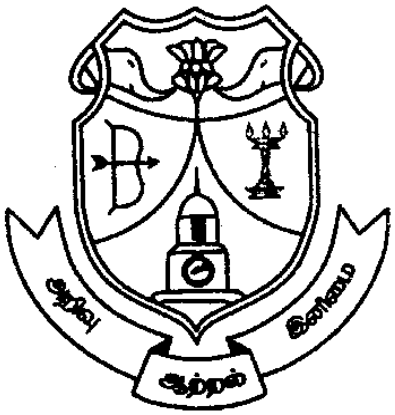
GOVERNMENT ARTS COLLEGE
(AUTONOMOUS)
SALEM – 636 007



Re-Accredited with B++ Grade by NAAC

DEGREE OF BACHELOR OF SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR B.Sc. MATHEMATICS

(Under CBCS with Semester Pattern)

FOR THE STUDENTS ADMITTED FROM

THE ACADEMIC YEAR 2017 – 2018 ONWARDS

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REGULATIONS

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

B.Sc. MATHEMATICS

Course Structure under CBCS

(For the candidates admitted from the academic year 2017-2018 onwards under CBCS)

SEMESTER SYSTEM WITH INTERNAL ASSESMENT

REGULATIONS

1. OBJECTIVES OF THE COURSE

Mathematics is the key to success in the field of Science and Engineering. Today, the students are in need of a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of mathematical ideas and tools to use them effectively in modeling, interpreting and solving the real world problems. Mathematics plays an important role in the context of globalization of Indian Economy, modern technology, Computer science and Information technology. This syllabus is aimed at preparing the students to compete with other Universities and put them on the right track.

2. ELIGIBILITY FOR ADMISSION

A candidate who has passed higher secondary examination with Mathematics (other than Business Mathematics) as one of the subjects under Higher Secondary Board of Examination, Tamil Nadu, or as per norms set by the Government of Tamil Nadu are permitted to appear and qualify for the B.Sc. Mathematics degree examination of this Autonomous College.

3. DURATION OF THE COURSE

The course of study shall be based on semester pattern with an internal assessment. The course shall consist of six semesters, each semester consisting of 90 working days and a total period of three years.

4. COURSE OF STUDY

The course of study shall comprise instructions in the following subjects according to the syllabus and books prescribed from time to time.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 636 007

(For the candidates admitted from the academic year 2017-2018 onwards under CBCS)
B.Sc., Mathematics

Part	Course code	Title of the course	Exam duration (Hrs.)	credits	Marks		
					I.A.	S.E.	TOTAL
SEMESTER –I							
1	17FTL01	Tamil Language course-I	3	3	25	75	100
2	17FEL01	English Language course - I	3	3	25	75	100
3	17UMT01	Core course-I : **Algebra and Trigonometry**	3	4	25	75	100
3	17APY01	Allied physics course - I	3	3	25	75	100
4	17UVABE	Common Course: **Value Based Education**	3	2	25	75	100
Total Credits and Marks				**15**			**500**
SEMESTER –II							
1	17FTL02	Tamil Language course - II	3	3	25	75	100
2	17FEL02	English Language course - II	3	3	25	75	100
3	17UMT02	Core course - II : **Differential Calculus**	3	4	25	75	100
3	17UMT03	Core course – III : **Integral and Vector Calculus**	3	4	25	75	100
3	17APY02	Allied physics course - II	3	3	25	75	100
3	17APYP1	Allied physics Practical - I	3	4	40	60	100
4	17UENST	Common Course**: Environmental Studies**	3	2	25	75	100
Total Credits and Marks				**23**			**700**
SEMESTER –III							
1	17FTL03	Tamil Language course - III	3	3	25	75	100
2	17FEL03	English Language course - III	3	3	25	75	100
3	17UMT04	Core course – IV: **Differential Equations**	3	4	25	75	100
3	17AST03	Allied Statistics Course –I : **Mathematical Statistics - I**	3	3	25	75	100
4	17UMTS1	Skill Based Elective Course – I: **Basic Algebra**	3	2	25	75	100
4	17UNME1	**Non – Major Elective Course: (From other Departments)**	3	2	25	75	100
Total Credits and Marks				**17**			**600**

Part	Course code	Title of the course	Exam duration (Hrs.)	credits	Marks		
					I.A.	S.E.	TOTAL
SEMESTER – IV							
1	17FTL04	Tamil Language course - IV	3	3	25	75	100
2	17FEL04	English Language course - IV	3	3	25	75	100
3	17UMT05	Core course - V : **Integral Transforms**	3	5	25	75	100
3	17UMT06	Core course – VI : **Mechanics**	3	5	25	75	100
3	17AST04	Allied Statistics Course –II : **Mathematical Statistics - II**	3	3	25	75	100
4	17UMTS2	Skill Based Elective Course – II: **Sequences and Series**	3	2	25	75	100
4	17UNME2	**Non – Major Elective Course: (From other Departments)**	3	2	25	75	100
3	17ASTP2	Allied Statistics Practical – II: **Mathematical Statistics - I**	3	4	40	60	100
5	17UEXAT	Common Course: **Extension Activities**		1		100	100
Total Credits and Marks				28			900
SEMESTER – V							
3	17UMT07	Core course – VII : **Modern Algebra - I**	3	5	25	75	100
3	17UMT08	Core course – VIII : **Real Analysis - I**	3	5	25	75	100
3	17UMT09	Core course – IX : **Complex Analysis - I**	3	5	25	75	100
3	17UMTE1	Major Based elective course – I: **Graph Theory**	3	5	25	75	100
3	17UMTE2	Major Based elective course – II: **Discrete Mathematics**	3	5	25	75	100
4	17UMTS3	Skill Based elective course – III: **Quantitative Aptitude - I**	3	2	25	75	100
4	17UMTS4	Skill Based elective course – IV: **Quantitative Aptitude - II**	3	2	25	75	100
Total Credits and Marks				29			700

Part	Course code	Title of the course	Exam duration (Hrs.)	credits	Marks		
					I.A.	S.E.	TOTAL
SEMESTER – VI							
3	17UMT10	Core course – X : **Modern Algebra – II**	3	5	25	75	100
3	17UMT11	Core course – XI : **Real Analysis – II**	3	5	25	75	100
3	17UMT12	Core course – XII : **Complex Analysis - II**	3	5	25	75	100
3	17UMTE3	Major Based elective course –III: **Operations Research**	3	5	25	75	100
3	17UMTE4	Major Based elective course –IV: **Numerical Methods**	3	4	25	75	100
4	17UMTS5	Skill Based elective course – V: **Quantitative Aptitude - III**	3	2	25	75	100
4	17UMTS6	Skill Based elective course – VI: **Quantitative Aptitude - IV**	3	2	25	75	100
Total Credits and Marks				**28**			**700**
Credits and Marks Grand Total				**140**			**4100**

5. EXAMINATIONS

The theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examination.

The practical examination shall be conducted at the end of each semester. The examination consists of Internal Assessment (IA) and the Semester Examination (SE).

IA Marks for Theory paper : Attendance (5) + Assignment (10) + Test (10) = 25 Marks

IA Marks for Practical Paper : Attendance (10) + Observation (15) + Test (15) = 40 Marks

Tests on Theory Subjects

In order to award 10 marks for the test component, three tests on each subject will be conducted of which the average of higher two scores will be taken into account.

Attendance

Marks	0 Mark	1 Mark	2 Mark	3 Mark	4 Mark	5 Mark
Percentage of Attendance	Below 50%	50% - 59%	60% - 69%	70% - 79%	80% - 89%	90%-100%

6. QUESTION PAPER PATTERN

a. For Theory

Time : 3 Hours Max. Marks :75

Passing Min.;30

PART – A: 10 X 2 =20

(Answer all Questions)

(Two Questions from each unit)

PART – B: 5 X 5 = 25

(Answer all Questions)

(One Question from each unit with Internal Choice)

Each question may contain one or two subdivisions depending upon the nature of questions.

PART – C : 3 X 10 = 30

(Answer any Three Questions out of five)

Each question may contain one or two subdivisions depending upon the nature of questions.

b. For Practical

Time : 3 Hours Max. Marks:60

Practical : 50

Record : 10

One / Two compulsory Problem(s) to be solved within 3 hours.

7. PASSING MINIMUM

A candidate shall be declared to have passed the examination if the candidate secures not less than 40% of the Marks in semester examination in each course or practical. The candidate should get a minimum of 49% marks in S.E. i.e., a minimum of 30 marks out of 75 in S.E. in theory courses. No passing Minimum marks for IA.

For practical courses, the distribution of marks will be IA 40, Practical 60 (Practical 50 + Record 10). The candidate should get a minimum of 24 marks out of 60 marks in practical examinations. The practical mark 50 and the record mark 10 will be taken together as 60 marks for practical examinations. No passing minimum for record note book. However submission of record note books is a must in the practical examinations.

8. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The performance of the student is indicated by letter Grades and the corresponding grade Point (GP), Grade Point Average (GPA) and the Cumulative Grade Point Average (CGPA).

Range of Marks*	**Grade points**	**Letter Grade**	**Description**
90 – 100	9.0 – 10.0	O	Outstanding
80 – 89	8.0 – 8.9	D+	Excellent
75 – 79	7.5 – 7.9	D	Distinction
70 – 74	7.0 – 7.4	A+	Very Good
60 – 69	6.0 – 6.9	A	Good
50 – 59	5.0 – 5.9	B	Average
40 – 49	4.0 – 4.9	C	Satisfactory
0 -39	0.0	U	Re – Appear
ABSENT	0.0	AAA	ABSENT

A student is deemed to have completed a course successfully and earned the appropriate credit, only if, the candidate earned a grade C and above. RA denotes the candidate should re-appear the course again.

Formula for GPA & CGPA

$$GPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum_{i=1}^{n} C_i} \qquad CGPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum_{i=1}^{n} C_i}$$

Where C_i - is the credits assigned to the course

GP_i - is the point corresponding to the grade obtained for each course

n - is the number of all courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA

$$GPA = \frac{Sum\ of\ the\ multiplication\ of\ Grade\ Points\ by\ the\ credits\ of\ the\ courses\ in\ a\ semester}{sum\ of\ the\ credits\ of\ the\ courses\ in\ a\ semester}$$

$$CGPA = \frac{Sum\ of\ the\ multiplication\ of\ Grade\ Points\ by\ the\ credits\ of\ the\ courses}{sum\ of\ the\ credits\ of\ the\ courses}$$

CLASSIFICATION

CGPA	**9 and above**	**I Class with distinction**
CGPA	**Between 7 and 8.9**	**I Class**
CGPA	**Between 5 and 6.9**	**II Class**

Note:

The above classification shall be given for

- Overall performance including Non – Major Electives and Skill based courses
- For Performance in the Part III only

9. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

10. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2017 – 2018 i.e., for students who are admitted to the first year of the course during the academic year 2017 – 2018 and thereafter.

11. TRANSITORY PROVISION

Candidates who were admitted to the UG course of study before 2017 -2018 shall not be permitted to appear for the examinations under these regulations.

FIRST YEAR

Semester – I

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)
I B.Sc., Mathematics, I Semester

Title of the paper: Algebra and Trigonometry **Paper Code: 17UMT01**

A. Objective:

The course is a prerequisite for the students to learn further topics of Mathematics in their higher semesters. At the end of the course the students would develop an understanding of the appropriate role of the Mathematical concept.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Be capable of identifying algebraic eigen value problem and the eigen value solutions in certain cases.
- Have learnt the basic ideas of roots, the relation between roots and co-efficients which frequently occur in scientific and engineering works.
- Have learnt the ideas of transformation of equation into another whose roots bear with the roots of the original equation which can be solved easily.
- Have learnt various applications of Demoivre's theorem such as expansion of $\sin n\theta, \cos n\theta, \tan n\theta$, expansion of $\sin^n \theta, \cos^n \theta, \sin^n \theta \cos^n \theta$ and $\sin\theta, \cos\theta, \tan\theta$ in terms of θ.
- Have an understanding of logarithm of a complex number and summation of trigonometric series.

C. Syllabus

Unit I

Characteristic equation – Characteristic roots and characteristic vectors – Properties – problems - Cayley Hamilton theorem (Statement only) - Applications of Cayley Hamilton theorem – problems.

Chapter 6:

Unit II

Theory of equations - Fundamental theorem in the theory of equations – Relation between roots and co-efficients – Imaginary and Irrational roots.

Chapter 7:

Unit III

Reciprocal equations - Transformation of equation – Multiplication of roots by m – Diminishing the roots of an equation – Removal of a term – Descarte's rule of signs – Descarte's rule of signs for negative roots of an equation – Horner's method upto two decimal places (Problems only).

Chapter 7:

Unit IV

Expansions of $\sin n\theta, \cos n\theta, \tan n\theta$, Expansions of $\sin^n \theta$, $\cos^n \theta, \sin^n \theta \cos^n \theta$, Expansions of $\sin\theta, \cos\theta, \tan\theta$ in terms of θ - Problems – Hyperbolic and Inverse Hyperbolic functions – Properties – Problems.

Chapter 11:

Unit V

Logarithms of complex numbers – summation of series

Chapter 11:

Text Books:

1. P.R. Vital, Algebra, Analytical Geometry and Trigonometry, year of publication 2000, Margham Publications.

Reference Books:

1. N.P. Bali, Trigonometry, Year of publication 1994.
2. T.K. Manicka vasagam pillai and S. Narayanan, Algebra (**Vol I**)Year of Publication 2004. Vijay Nicole Imprints Pvt. Ltd.,
3. T.K. Manicka vasagam pillai and S. Narayanan, Trigonometry, Year of publication 2004. Vijay Nicole Imprints Pvt. Ltd.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Expansions of trigonometric functions.
2. Summation of series.
3. Matrices.

F. Group Tasks

1. Try to find the applications of theory of equations and give a presentation.

2. Get a physical eigen value problem and give a presentation.

FIRST YEAR

Semester – II

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)
I B.Sc., Mathematics, II Semester

Title of the paper: Differential Calculus **Paper Code: 17UMT02**

A. Objective:

Calculus is a study of how things change. It provides a frame work for modeling system in which there is a change and a way to deduce the predictions of such models. The course is a prerequisite for the students to learn further topics of Mathematics in their higher semesters.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Have learnt the method of finding nth derivative and to use Leibnitz theorem and also understands effectively the geometrical aspects of curvature, radius of curvature, involutes, evolutes of plane curves which are essential and elegant applications of differential calculus.
- Have understanding in handling functions of more than one variable for finding the maxima and minima of functions of two variables and Lagrange's multipliers for finding maxima and minima along with the given constants.
- Have learnt the methods of double and triple integration which are needed in higher studies in other areas along with the confidence to handle integrals of higher orders.
- Have studied the basics of vector calculus comprising of gradient, divergence and curl which is mostly used in the study of solenoidal and irrotational fields in physics.
- Have learnt the application of line integrals which represent the workdone in mechanics. Also surface and volume integrals and the classical theorems involving line, surface and volume integrals which would be encountered by them in higher semesters.

C. Syllabus

Unit I:

Successive Differentiation – nth derivative of standard functions – Leibnitz theorem (without proof) – problems.

Chapter 1 & Chapter 2

Unit II:

Curvature and Radius of curvature in Cartesian and polar co-ordinates – envelopes – evolutes.

Chapter 6, Chapter 8 and Chapter 9:

Unit III:

Total differential co-efficient – Implicit functions – Jacobian – maxima and minima of functions of two variables – Lagrange's multiplier methods.

Chapter 3 :

Unit IV:

Polar co-ordinates – Angle between radius vector and tangent - angle of intersection of two curves – Length of perpendicular from the pole of the tangent – Pedal equation (p-r equations).

Chapter 5 :

Unit V:

Asymptotes – working rule for finding asymptotes - Asymptotes parallel to axes of co-ordinates – Another method of finding asymptotes(factor method) – asymptotes by inspection – Intersection of a curve and its asymptotes (Problems only).

Chapter 7 :

Text Book:

1. P.R. Vittal and V.Malini, Calculus, year of publication 2000. Margham Publications.

Reference Books:

1. S. Narayanan & T.K. Manica vachagom Pillay, Calculus, Volume – I, Year of publication 2004, Vijay NicholeImprints Private Limited, Chennai.
2. D. Sudha, Calculus, year of Publication 1988, Emerald Publishers.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Maxima and minima of two variables.
2. Finding asymptotes by different methods

F. Group Tasks

1. Learn to use Math Lab for getting the values of successive derivatives for a given one dimensional function and do a presentation.

2. Identify an application of polar co-ordinates and explain the same.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

I B.Sc., Mathematics, II Semester

Title of the paper: Integral and Vector Calculus **Paper Code: 17UMT03**

B. Objective:

Integral Calculus is a study of how things change. It provides a frame work for modeling system in which there is a change and a way to deduce the predictions of such models. The course is a prerequisite for the students to learn further topics of Mathematics in their higher semesters.

C. Learning Outcomes:

After the completion of the chapters the students are expected to

- Have learnt the methods of double and triple integration which are needed in higher studies in other areas along with the confidence to handle integrals of higher orders.
- Have studied the basics of vector calculus comprising of gradient, divergence and curl which is mostly used in the study of solenoidal and irrotational fields in physics.
- Have learnt the application of line integrals which represent the workdone in mechanics. Also surface and volume integrals and the classical theorems involving line, surface and volume integrals which would be encountered by them in higher semesters.

D. Syllabus

Unit I:

Bernoulli's formula for integration by parts – Reduction formulae – Problems - Beta & Gamma functions- Properties – Relation between Beta and Gamma functions – Evaluation of definite integrals using Beta and Gamma functions – Problems.

Chapter 11 & 13[1]

Unit II:

Double integrals –Double integrals in polar co-ordinates - Triple integrals – Problems.

Chapter 17 [1]

Unit III:

Change of order of integration – Application of Double and Triple Integrals to Area, Volume and Centroid.

Chapter 17 [1]

Unit IV:

Vector differentiation – Gradient, curl and Divergence of a Scalar and vector point function – Directional derivative of a scalar point function - unit normal vector - Divergence and Curl of a vector point function – Definitions – Solenoidal and irrotational vectors – problems.

Chapter 28 [2]

Unit V:

Line integrals – Surface integrals - Volume integrals - Gauss divergence theorem , Stoke's theorem, Green's theorem(statement only) – problems.

Chapter 29 [2]:

Text Book:

2. P.R. Vittal and V.Malini, Calculus, year of publication 2000. Margham Publications.
3. P.R. Vittal and V.Malini, Allied Mathematics, year of publication 2000. Margham Publications. (Unit IV and Unit V only)

Reference Books:

2. **S**. Narayanan & T.K. Manica vachagom Pillay, Calculus, Volume – II & III, Year of publication 2004, Vijay Nichole Imprints Private Limited, Chennai.
3. P.R. Vittal, Vector Analysis, Analytical geometry & sequences and series, Margham Publications.
3. D. Sudha, Calculus, year of Publication 1988, Emerald Publishers.

D. Additional web resources:

1. *en.wikipedia.org/wiki/* 2. *mathworld.wolfram.com* *3. wiki.answers.com*

E. Assignments:

Problems can be given in the following topics:

1. Vector integration.
2. Changing the order of integration.

F. Group Tasks

1. Identify an application of line integrals in physics and explain the same.

SECOND YEAR

Semester – III

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

II B.Sc., Mathematics, III Semester

Title of the paper: Differential Equations **Paper Code: 17UMT04**

C. Objective:

Many of the general laws of nature in Physics, Chemistry, Biology and Astronomy can be expressed in the language of differential equations and hence the theory of differential equations is the most important part of Mathematics for understanding Physical Sciences. Hence on completion of the course the students are expected to have learnt the method of solving systems of differential equations of certain types that they might encounter to their higher studies.

D. Learning Outcomes:

After completion of these chapters the student are expected to

- Have learnt the solution procedure for Ordinary Differential Equations of first order and higher degree and also a solution methodology for linear differential equation with constant co-efficients.
- Have learnt the solution methodology for solving second order differential equations with variable co-efficients and total differential equations.
- Have learnt the solution of differential equations whose solution cannot be expressed in terms of polynomials, rational functions, exponentials, trigonometric functions etc. can be obtained in terms of power series.
- Have confidence in forming a Partial Differential Equation by eliminating the arbitrary constants and functions. Also to describe various methods of finding the solution to first order non linear PDE.
- Have learnt the method of solving Clairaut's equation, Charpits method and Lagrange's equation and the solution methodology for higher order PDE.

E. Syllabus

UNIT I

Differential Equations – Equations of first order and higher degree – Equation solvable for p – Solvable for y – Solvable for x – Clairaut's equation. Second order differential equations with constant co-efficients – Particular integrals of $e^{ax}, x^m, \sin ax, \cos ax, e^{ax}V$, where V is any function of x, $x^m(\sin ax \ or \ \cos ax)$ - problems.

Chapter 1(B), Chapter 2:

UNIT II

Second order Differential Equations with variable coefficients – variation of parameters – problems in all the above sections – Total differential equation $Pdx + Qdy + Rdz = 0$ – Condition for integrability – problems.

Chapter 3, Chapter 4:

UNIT III

Solutions of differential equations by power series method – power series – Frobenius method.

Chapter 9:

UNIT IV

Formation of Partial differential equations by eliminating arbitrary constants and arbitrary functions – Non-linear differential equations of first order – definition – Complete, Particular, Singular and general integrals – Solutions of the Partial Differential Equations of Standard types - Clairaut's equation.

Chapter 5:

UNIT V

Charpit's method - solving Lagrange's equation – problems – Partial Differential Equation of higher order – Homogeneous linear equation – Non- homogeneous linear equation.

Chapter 5[1], Chapter 2[2]: (Section 2.17 to section 2.22)

Text Book:

1. P.R. Vittal, Differential Equations, Fourier and Laplace Transforms, Probability – Year of Publication 2000, Margham Publications, 24, Rameshwaram Road, T.Nagar, Chennai – 600 017.
2. Kandasamy, Gunavathi & Thilagavathy – Engineering Mathematics – III, Year of Publication 1996, Emerald Publishers. 135, Anna Salai, Chennai – 600 002. (For Unit V chapter:2 only)

Reference Books:

1. S.Narayanan and Manickavasagam pillai, Differential equations and its applications, Year of publication 2004, Vijay Nicole Imprints Pvt Ltd.
2. A. Singaravelu – Differential Equations and Laplace Transforms – Year of Publication 2002 Meenakshi Publisher, 120, Pushpa Nagar, Medavakkam, Chennai – 601 302.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Lagrange's multiplier method.
2. Method of variation of parameters.
3. Higher order PDE – Homogeneous linear equation.

F. Group Tasks

1. Try to use a software package to solve ordinary differential equations and give a presentation.

2. Compare the ODE and PDE with a suitable model.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

II B.Sc., Mathematics, III Semester

Title of the paper: Skill based elective course I: Basic Algebra **Paper Code: 17UMTS1**

A. Objective:

This provides a basic knowledge of functions and relations to the learners and to understand the modern mathematics. It motivates the learners on algebra there by to lay foundation for future studies.

B. Learning Outcomes:

Students who successfully complete the course are expected to have

- An idea to distinguish certain ordered pairs from others and to define the relations from a set S to itself.
- An ability to understand the equivalence classes and the partitions.
- An ability to understand the other type of relation which arises in Mathematics and defined by the partial ordered sets and lattices.
- An ability to understand the notion of functions, surjective and bijective functions.
- An ability to understand the inverse functions and some identities of functions.

C. Syllabus

Unit I

Relations - Equivalence relations – Examples – problems - Theorems.

Chapter 2: Section 2.1 to 2.2

Unit II

Equivalence classes – partition – examples – problems - Theorems.

Chapter 2: Section 2.2

Unit III

Partial ordered sets - Representation of finite posets by diagrams – lattices – Definition -Examples.

Chapter 9: Section 9.1 to 9.2

Unit IV

Functions – examples – Injective - Surjective and bijective functions - composite of functions - problems.

Chapter 2 : Section 9.1 to 9.2

Unit V

Identity and inverse functions – Theorems - Problems.

Chapter 2:

Text Book:

1. Dr. S. Arumugam Isaac A. T., Modern Algebra, New Gamma Publishing House, Palayam Kottai, 2006.

Reference Book:

1. S. G. Venkatachalapathi, Allied Mathematics, Margham Publication, Chennai-17, Reprint 2011.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Exercises can be given in the following topics:

1. Cartesian products, relations and to verify for the equivalence relations.
2. Functions, one – one functions and onto functions.
3. Inverse functions and the identities.

F. Group Tasks

Quiz competition can be conducted by giving exercises in the above topics.

SECOND YEAR

Semester – IV

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

II B.Sc., Mathematics, IV Semester

Title of the paper: Integral Transforms **Paper Code: 17UMT05**

A. Objective:

The transforms such as Laplace Transform, Fourier Transform and Z- Transform are widely used in the theory of communication engineering, wave propagation and other branches of applied Mathematics. Fourier series find its application with the study of vibration and heat diffusion.

B. Learning Outcomes:

After completion of these chapters the student are expected to

- Have a sound knowledge of Laplace Transform and its properties.
- Have sufficient exposure to get the solution of certain linear differential equation using Laplace Transform and inverse Laplace Transform.
- Have an idea of periodic function and come to know how to expand the given functions as a series of sines and cosines which are simple periodic functions.
- Have an idea of Fourier Transform and its properties which can be applied in future for solving Partial Differential equations by reducing the number of independent variable by one.
- Have a knowledge of Z- Transform and its properties and gain exposure to get the solution of the difference equations which plays an important role in discrete time signals.

C. Syllabus

UNIT I

Laplace transforms – Definition and properties– elementary theorems with proof –periodic function - problems.

Chapter 7: (Section 1 to section 3)

UNIT II

Inverse Laplace transforms – standard formulae – elementary theorems problems – applications to solving second order differential equations with constant coefficients - Application to solving first order simultaneous differential equations.

Chapter 7: (Section 4 & section 5)

UNIT III

Fourier series – definition – to find the Fourier coefficients of periodic functions of period 2π – even and odd functions – half range series – problems.

Chapter 6:

UNIT IV

Fourier integral theorem(Statement only) – complex Fourier Transform and its inversions - properties of Fourier transforms – linearity property – change of scale – shifting property – sine and cosine transforms – properties - simple problems.

Chapter 8:

UNIT V

Z - transforms – elementary properties – Inverse Z transform – Long division method – Partial fraction method – Convolution theorem – Formation of difference equations – Solutions of difference equations.

Chapter : 5[2]

Text Books:

1. P.R. Vittal, Differential Equations, Fourier and Laplace Transforms, Probability – Year of Publication 2000, Margham Publications, 24, Rameshwaram Road, T.Nagar, Chennai – 600 017 (Unit I to Unit IV).
2. P. Kandasamy, K.Thilagavathy, K.Kunavathy, Engineering Mathematics, Vol-III, S. Chand 2006 (Unit V).

Reference Books:

1. T.K. Manickavasagam pillai and S. Narayanan: Calculus (Vol III) – Year of Publication 2004.Vijay Nicole Imprints Pvt Ltd, # C-7 Nelson Chambers, 115, Nelson Manickam Road, Chennai – 600 029
2. K. Shankar Rao: Introduction to partial differential equations – (Pp-278 to 291) – Year of Publication 1997. Prentice Hall India – New Delhi – 110 001.

D. Additional web resources:

1. en.wikipedia.org/wiki/Z-transform 2. en.wikipedia.org/wiki/Laplace_transform
3. mathworld.wolfram.com 4. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Solving differential equations using Laplace Transform.
2. Solving difference equations using Z transform.
3. Fourier transform.

F. Group Tasks

1. In control engineering and control theory the **transfer function** is derived using the Laplace transform.

Get an example from control theory and make a presentation.

2. Make a comparison between the transforms Laplace, Fourier and Z-transform.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

II Year B.Sc., Mathematics, IV Semester

Title of the paper: Mechanics **Paper Code: 17UMT06**

A. Objective:

Statics is the subdivision of mechanics that is governed with the forces that act on bodies at rest under equilibrium conditions. The methods and results of the science of statics have proved especially useful in designing building, bridges, dams as well as cranes and other similar mechanical devices. Statics provides for engineers and architects the analytical and graphical procedures needed to identify and describe uniform forces. The study of dynamics provides quantitative predictions of the motions of material objects. Its basic principles are linked to electrodynamics and thermodynamics. In technology, Dynamics forms the basis for the design of high speed vehicles, fluid flow devices, eletromechanical system, structures subject to wind and earthquake effects etc.

B. Learning Outcomes:

After completion of these chapters students are expected to

- Have knowledge about the law of parallelogram of forces, Lami's theorem and Resolution of forces.
- Have studied about the like parallel forces, unlike parallel forces, moments, Varigon's theorem of moments and their properties.
- Have an idea of the coplanar motions of particles under gravity and forces on a projectile.
- Have gained the knowledge of simple harmonic motion and their properties.
- Have understanding about the radial and transverse components of velocity and acceleration, differential equation of a central orbit and their properties.

C. Syllabus

UNIT – I : Forces Acting at a point

Law of parallelogram of forces – Lami's theorem – Resolution of forces.

Chapter 2 : Section 1 to 4 & Sections 9 to 16 [1]

UNIT – II : Parallel Forces and Moments

Like parallel forces – Unlike parallel forces – Moments – Varigon's theorem of moments – Generalized theorem of moments – Equation to common catenary – Tension at any point – Geometrical properties of common catenary – Approximation to the shape of the catenary – The parabolic catenary.

Chapter 3: Sections 1 to 13 & Chapter 11: Sections 1 to 9 [1]

UNIT – III : Projectiles

Projectiles – Path of a projectile – Time of flight – Horizontal range – Motion of a projectile up an inclined plane.

Chapter 6: Sections 6.1 to 6.16 [2]

UNIT – IV : Simple Harmonic Motion

Definition of Simple Harmonic Motion – Geometrical representation of Simple Harmonic Motion – Composition of Simple Harmonic Motion of the same period and in the same line – Composition of Simple Harmonic Motion's of the same period in two perpendicular directions.

Chapter 10: Sections 10.1 to 10.7 [2]

UNIT – V : Motion Under the Action of Central forces

Radial and transverse components of velocity and acceleration – Differential equation of a central orbit – Given the orbit to find the law of force – Given the law of force to find the orbit.

Chapter 11: Sections 11.1 to 11.13 [2]

Text Book

1. M. K. Venkataraman, Statics, Agasthiar Publications, 2007 (Units I & II)

2. M. K. Venkataraman, Dynamics, Agasthiar Publications, 2009 (Units III, IV & V).

Reference Books

1. K. Viswanath Naik, M. S. Kasi, Statics

2. K. Viswanath Naik, M. S. Kasi, Dynamics

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Projectiles.
2. Simple Harmonic Motion.
3. Equation to common catenary.

F. Group Tasks

1. Solve the problems in resolution of forces.
2. Calculate the horizontal and vertical components with respect to velocity and position of a projectile at various points along its path.
3. Give some examples for simple harmonic Oscillator.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

II B.Sc., Mathematics, IV Semester

Title of the paper: Skill based elective course II: Sequences and series Paper Code: 17UMTS2

A. Objective:

This provides fundamental ideas and properties of sequences and series. It motivates the learners to solve the sequences and series problems.

B. Learning Outcomes:

Students who successfully complete the course are expected to have

- An idea about sequences, bounded sequences and its convergence and divergence.
- An ability to understand the Algebra of limits and the behaviour of monotonic sequences.
- An ability to understand the subsequence and Cauchy sequences.
- An ability to understand the concept of infinite series and to test the convergence of series of positive terms.
- An idea about some of the convergence tests.

C. Syllabus

Unit I

Sequences - Bounded, Monotonic, Convergent, Divergent - Oscillating sequences.

Chapter 3: Sections 3.1 to 3.5

Unit II

Algebra of limits - Behaviour of monotonic sequences - Cauchy's first limit theorem - Cesaro's Theorem.

Chapter 3: Sections 3.6 to 3.8

Unit III

Cauchy's Second limit theorem – Subsequences – Limit points - Cauchy sequence.

Chapter 3: Sections 3.8 to 3.11

Unit IV

Upper and lower limits of sequences – Infinte Series - comparison test.

Chapter 3: Section 3.12 & Chapter 4: Sections 4.1 to 4.2

Unit V

Kummer's test - Root test - condensation test - integral test – Problems only.

Chapter 4: Sections 4.3 to 4.5

Text Book:

1. S. Arumugam and Thangapandi Isaac A., Sequences and series, New Gamma Publishing House, Palayam Kottai, 2006.

Reference Book:

1. Natarajan. S., Sequence and Series, S. V. Publications, Chennai.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Exercises can be given in the following topics:

1. To identify the sequences whether they are bounded or oscillating.
2. To get some sequences and series and to test for its convergence.
3. To differentiate between the various tests in the above topics.

F. Group Tasks

Some of the sequences and series can be given and the students can be asked to tests for its convergence.

THIRD YEAR

Semester – V

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Title of the paper: Modern Algebra- I **Paper Code: 17UMT07**

A. Objectives:

The main objective of the course is to learn the concept of groups, rings fields, Homomorphism, isomorphism and ideals.

B. Learning Outcomes:

On successful completion of this course students will be able to

- Define group and its properties, and understand the meaning of subgroups, cyclic groups, cosets and Lagrange"s theorem.
- Describe fundamental properties of the normal subgroups, Quotient groups and all kinds of morphisms
- Define a ring with examples, properties of rings and subfields
- Demonstrate an understanding of ideals and quotient rings, maximal ideals and prime ideals.

C. Syllabus:

Unit – I: Group Theory :

Definition of Group – Some Examples of Groups - Some Preliminary Lemmas - Subgroups – Definition – Lemmas - Theorems (Legrange's, Euler and Fermat) – Examples.

(Sections ; 2.1 to 2.4)

Unit – II: Group Theory (Continuation):

A Counting Principle – Normal Sub Groups and Quotient Groups - Homomorphism – Definition – Lemmas – Theorems – Examples.

(Sections 2.5 to 2.7).

Unit – III: Group Theory (Continuation):

Automorphism- Cayley's Theorem - Permutation Groups – Definition – Lemmas – Theorems – Examples.

(Sections: 2.8 to 2.10).

Unit – IV: Ring Theory:

Definition and Examples of Rings – Some Special Classes of Rings – Homomorphisms – Ideals and Quotient Rings - More Ideals and Quotient Rings – Definition – Lemmas – Theorems – Examples.

(Section: 3.1 to 3.5).

Unit – V: Ring Theory (Continuation):

The field of quotient of an Integral Domain – Euclidean Rings – A Particular Euclidean Ring - Polynomial Rings – Definition – Lemmas – Theorems – Examples – Polynomials over the Rational field – Polynomial rings over the commutative Rings.

(Sections: 3.6 to 3.11)

Text Book

Topics in Algebra by I. N. Herstein, John Wiley, New York 1975.

Reference Books

1. Modern Algebra by M. L. Santiago, Tata McGraw Hill, New Delhi, 1994.

2. A First Course in Modern Algebra by A. R. Vasishtha, Krishna PrekasanMandhir, 9, Shivaji Road, Meerut (UP), 1983.

3. Mathematics for Degree Students (B. Sc. 3 Years) by Dr. U.S. Rana, S. Chand 2012.

4. Modern Algebra by K. ViswananthaNaik, Emerald Publishers, 135, Anna Saslai, Chennai.

D. Additional web resources:

1. en.wikipedia.org/wiki 2. Wiki.answers.com3. mathworld.wolfram.com

E. Assignments:

Assignments can be given from the following topics:

1. Group Homomorphism. 2. Ideals. 3. Rings and fields.

F. Groups Tasks

Two group ideals can be given in the form of group discussion, Quiz etc. in the topics of permutation groups, ideals, subrings and subfields.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7
(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Title of the paper: Real Analysis - I **Course Code: : 17UMT08**

A. Objective:

The main objective of the course is to learn the concept of countability, convergence sequence, divergence sequence, bounded sequence, monotonic sequence, open sets and closed sets. This course aims to acquaint the students with various topics of real analysis.

B. Learning Outcomes:

On successful completion of this course students will be able to

- Define the rational numbers, the natural numbers, and the real numbers, and understand their relationship to one another and describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Define Cauchy sequence and prove that specific sequences are Cauchy.
- Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
- Prove standard results about closures, intersections, and unions of open and closed.
- Define convergence of series using the Cauchy criterion and use the comparison and root tests to show convergence of series.
- Define limit superior and limit inferior and to use properties of limits.
- Present an overview of the basic properties of metric spaces and give standard examples of discontinuous functions, such as the Dirichlet function.

C. Syllabus

UNIT- I

Equivalence - Countability – Real numbers – Least upper bounds- Sequences of real numbers – Definition of sequence and subsequence – Limit of a sequence - Convergent sequences – Divergent sequences.

Chapter 1: Sections 1.5 to 1.7 & Chapter 2: Sections 2.1 to 2.4

UNIT- II

Bounded sequences – Monotone Sequences – Operations on convergent sequences - Operations on divergent sequences - Limit Superior and limit inferior – Cauchy sequences.

Chapter 2: Sections 2.5 to 2.10

UNIT- III

Series of real numbers – Convergence and divergence – Series with non-negative terms- Alternating series – Conditional convergence and absolute convergence – Tests for absolute convergence - Series whose terms form a non-increasing sequence.

Chapter 3: Sections 3.1 to 3.4, 3.6, 3.7

UNIT- IV

Limits and metric spaces – Limit of a function on the real line – Metric spaces – Limits in metric spaces - Functions continuous at a point on the real line - Reformulation.

Chapter 4: Sections 4.1 to 4.3 & Chapter 5: Sections 5.1 to 5.2

UNIT- V

Functions continuous on a metric space - Open sets – Closed sets – Discontinuous functions on R^1.

Chapter 5: Sections 5.3 to 5.6

Text Book:

1. Richard R.Goldberg – Methods of Real Analysis – Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi.

Reference Books:

1. Tom. M. Apostal – Mathematical Analysis –Year of Publication 2002 Narosa Publications, New Delhi.
2. Sterling K. Bargerian- A First course in real analysis – year of Publication 2004. Springer (India) Private Limited. New Delhi
3. M.S.Rangachari –Real Analysis Year of Publication 1996 New Century Book House, Chennai

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. wiki.answers.com
3. mathworld. wolfram.com 4. ects.ieu.edu.tr

E. Assignments:

1. Prove that any bounded sequence of real numbers has a convergent subsequence.
2. State and prove Leibnitz theorem.
3. If G_1 and G_2 are open subsets of the metric space M, then prove that $G_1 \cap G_2$ is also open.

F. Group Tasks

1. Label each of the following sequences either (A) convergent, (B) divergent to infinity, (C) divergent to minus infinity, or (D) oscillating. (Use your intuition or information from your calculus course. Do not try to prove anything.)

a) $\{\sin(n\pi/2)\}_{n=1}^{\infty}$ b) $\{\sin n\pi\}_{n=1}^{\infty}$

c) $\{e^n\}_{n=1}^{\infty}$ d) $\left\{e^{1/n}\right\}_{n=1}^{\infty}$

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Title of the paper: Complex Analysis – I **Paper Code: 17UMT09**

A. Objective:

The theory of complex Analysis is one of the most outstanding accomplishments of classical mathematics. Complex analysis is a rich area of Mathematics. Its applications are numerous and can be found in many other branches of Mathematics, ranging from number theory, fluid dynamics and computer sciences.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- Have knowledge about the regions in the complex plane, functions of a complex variable, limits and their properties.
- Have learnt the derivative of functions W(t), definite integrals of functions W(t), contours, contour integrals and their properties.
- Have a sufficient exposure to various theorems like Maximum modulus theorem, Liouville's theorem etc.
- Have learnt the mappings and their properties.
- Have learnt the elementary transformations, Bilinear transformation and various mappings.

C. Syllabus

UNIT – I

Regions in the Complex Plane - Functions of a complex variable - Limits - Theorems on Limits - Limits Involving the Point at Infinity - Continuity - Derivative – Differentiation Formulas - Cauchy - Riemann Equations - Sufficient Conditions for differentiability - polar coordinates – Analytic Functions – Examples – Harmonic Functions.
Chapter 1: Section 8 & Chapter 2: Sections 11 to 21

UNIT – II

Complex valued functions W(t) - Contours - Contour Integrals - Some Examples - Examples with Branch cuts - Upper bounds for Moduli of contour Integrals - Anti-derivatives - Proof of the theorem – Cauchy-Goursat Theorem - Proof of the theorem - Simply connected Domains - Multiply connected Domains.
Chapter 4: Sections 30 to 38

UNIT – III

Cauchy Integral Formula - An Extension of the Cauchy integral formula - Some consequences of the extension - Liouville's Theorem and the Fundamental Theorem of Algebra - Maximum modules Principle.

Chapter 4: Section 39 to 43

UNIT – IV

Mappings - Mappings by the elementary Functions - Linear Transformations - the transformation $w = 1/z$ - Linear Fractional Transformations - An Implicit form.

Chapter 2: Section 10 & Chapter 7: Sections 64 to 66

UNIT – V

The Transformation $w = e^z$, $w = \log z$, $w = \sin z$, $w = \cos z$, $w = \sinh z$, $w = \cosh z$ - Mappings by z^2 and branches of $Z^{1/2}$ - Conformal mappings - preservation of Angles - Scale factors - Local Inverses.

Chapter 7: Sections 68 to 71 & Chapter 8: Sections 73 to 74

Text Book

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, McGraw Hill, Inc, Fifth Edition.

Reference Books

1. P.P Gupta – Kedarnath & Ramnath, Complex Variables, Meerut -Delhi
2. J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media(P) Ltd, 13th Edition, 1996-97.
3. T.K.Manickavachaagam Pillai, Complex Analysis, S.Viswanathan Publishers Pvt Ltd.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com

E. Assignments:

Problems can be given in the following topics:

1. Limits and Continuity.
2. Contour Integrals.
3. Mappings by the Exponential Function.

F. Group Tasks

1. Discussion about the applications of transformations in graphics.
2. Problems in contour integration can be solved.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Major based elective course : Graph Theory **Course Code: : 17UMTE 1**

A. Objective:

In the last two decades graph theory has established itself as a worthwhile mathematical discipline and there are many applications of graph theory to a variety of subjects which include Operations research, Physics, Chemistry, Economics, Genetics, Sociology, Engineering, Computer Science, Bio informatics etc.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- Have a sound knowledge about graphs, subgraphs and operations of graphs.
- Have an idea on walks, Trials, Paths and Connectedness.
- Have a sufficient exposure of Eulerian and Hamiltonian graphs.
- Have an idea of trees and Matching in Bipartite graph.
- Have a knowledge of planar graphs and its properties, Chromatic number and Chromatic edges.

C. Syllabus

UNIT –I : Graphs and Subgraphs

Introduction – Definition and example – Degrees – sub graphs- Operations on Graphs .

Chapter 2: Sections 2.0 to 2.3 and 2.9

UNIT –II : Connectedness

Introduction – Walks, trails and paths - Connectedness and Components- Blocks - connectivity .

Chapter 4: Sections 4.0 to 4.4

UNIT –III : Eulerian and Hamiltonian Graphs

Introduction – Eulerian Graphs –Konigsberg Bridge problem – Fleury's algorithm – Hamiltonian Graphs.

Chapter 5 :Sections 5.0 to 5.2 & Chapter 1: Section 1.1

UNIT –IV : Trees and Matchings

Introduction – characterization of Trees –center of a tree – Matchings - Introduction – Matchings in bipartite graphs.

Chapter 6: Sections 6.0 to 6.2 & Chapter 7: Sections 7.0 to 7.2

UNIT –V : Planarity

Planarity – Introduction – Definition and properties – Characterization of planar graphs – Thickness, Crossing and Outer planarity – Colourability – Introduction – Chromatic number and chromatic index – The five colour theorem.

Chapter 8 : Sections 8.0 to 8.3)

Text Book:

1. S.Arumugam, S.Ramachandran - Invitation to Graph Theory – Scitech Publications (India) Pvt. Ltd., Chennai-600 017.

Reference books:

1. S.Kumaravelu & Suseela Kumaravelu – Graph Theory- year of publication 1996 - SKV Printers.
2. A.Chandran –A First course in Graph Theory - Year of publication 1997 – Macmillan Publishers - Chennai.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com

E. Assignments:

1. A (p,q) graph has t points of degree m and all other points are of degree n, then show that (m-n)t + pm = 2q .
2. If every block of a connected graph G is Eulerian then show that G is Eulerian.
3. If G is a connected (p,q) plane graph with girth g, $q \leq \frac{g(p-2)}{g-2}$.

F. Group Tasks

1. Different ways to analyse a line graph and compare over age groups.
2. Determine an integer invariant of a graph (or of a point or of a line in the graph etc.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Title of the Paper: Discrete Mathematics **Course Code: 17UMTE2**

A. Objective:

It brings out the relation between mathematics and computer science, in the way how it could be applied. The need of discrete structure is how we apply the mathematics in computer science. It will be applied not only in computer science and also how mathematics will be applied in engineering.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- Have an idea of mathematical logics and how to write principle of conjunctive normal form and disjunctive normal form.
- It brings the idea of how the functions and relations will be applied in computer science.
- To know the idea of binary and n – ary operations and partition of sets.
- It helps to understand the concepts of permutation and combination.

C. Syllabus

UNIT I : Logic

Connectives – Tautology - Contradiction – Equivalence - Duality – Propositions – Tautology implications - Normal forms.

Chapter 1:

UNIT II: Logic (continued…)

Disjunctive and Conjunctive normal forms – Principle of disjunctive and Conjunctive normal forms – Inference Theory – Truth table techniques.

Chapter 1:

UNIT III: Combinatorics

Permutations – Combinations – Permutation with repetition – Circular Permutation - Pigeon hole principle – Mathematical induction – Recurrence relation.

Chapter 6:

UNIT IV: Number Theory

Divisibility – Prime Numbers – Fundamental theorem of Arithmetic – GCD – LCM –

Congruence - Congruence class of mod m – Linear congruence – Reminder theorem.

Chapter 3:

UNIT V: Formal Languages and Automata theory

Phrase-structure grammar – types of Grammar – Backus-Naur Form(BNF) – Finite State Machine(FSM) – Input and output strings for FSM – Finite state Automata (FSA)

Chapter 8:

Text Book:

1. T. Veerarajan – Discrete Mathematics – Year of publications reprint 1993, Tata McGraw – Hill

   Publishing Company Ltd., New Delhi.

Reference books:

1. J.P.Tremblay, R.Manohar – Discrete mathematical structures with applications to computer science – Tata Mc Graw Hill Publishing Company Ltd., Edition1997.
2. Kolman, Busby, Ross – Discrete mathematical structures – Pearson publications, edition 2004.
3. A.Singaravelu – Discrete Mathematics – Meenakshi publishing company.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com

3. wiki.answers.com

E. Assignments:

Assignments can be given from the following topics:

1. How to write PCNF, PDNF with and without using truth table.
2. Method of writing graph of relation and matrix of relation.
3. Problems to use Pigeon hole principles.

F. Group Tasks

1. Discussion about CNF and DNF.

2. How to apply circular permutation in computer science.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Skill based elective course III: Quantitative Aptitude – I **Course Code: 17UMTS3**

A. Objective:

This syllabus aims to introduce students to use quantitative methods and techniques for effective decision-making model formulation and applications that are used in solving business decision problems. To test the grasp of elementary concepts in Mathematics and Statistics and application of the same as useful quantitative tools.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes by tests and homework.

- An ability to calculate Partnership - Chain
- An ability to calculate Time and Work
- An ability to calculate Pipers & Cisterns
- An ability to calculate Time & Distance
- An ability to calculate Problems on Trains

C. Syllabus

UNIT I

Partnership - Chain

Sections 1.13 to 1.14

UNIT II

Time and Work

Section 1.15

UNIT III

Pipers & Cisterns

Section 1.16

UNIT IV
Time & Distance
Section 1.17

UNIT V
Problems on Trains
Section 1.18

Text Book:

1. R.S. Aggarwal – Quantitative Aptitude – For Competitive Examinations, S.Chand & Company Ltd, Reprint 2008.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

1. If the cost of x metres of wire is d rupees, then what is the cost of y metres of wire at the same rate?
2. P is able to do a piece of work in 15 days and Q can do the same work in 20 days. If they can work together for 4 days, what is the fraction of work left?
3. A train is running at a speed of 40 km/hr and it crosses a post in 18 seconds. What is the length of the train?

F. Group Tasks

1. In a dairy farm, 40 cows eat 40 bags of husk in 40 days. In how many days one cow will eat one bag of husk?
2. A is thrice as good as B in work. A is able to finish a job in 60 days less than B. They can finish the work in - days if they work together.
3. A train has a length of 150 meters . it is passing a man who is moving at 2 km/hr in the same direction of the train, in 3 seconds. Find out the speed of the train.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, V Semester

Skill based elective course IV: Quantitative Aptitude – II **Course Code: 17UMTS4**

A. Objective:

This syllabus aims to introduce students to use quantitative methods and techniques for effective decision-making model formulation and applications that are used in solving business decision problems. To test the grasp of elementary concepts in Mathematics and Statistics and application of the same as useful quantitative tools.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes by tests and homework.

- An ability to calculate Boats & Streams
- An ability to calculate Allegation or Mixture
- An ability to calculate Simple Interest
- An ability to calculate Compound Interest
- An ability to calculate Logarithms

C. Syllabus

UNIT I

Boats & Streams

Section 1.19

UNIT II

Allegation or Mixture

Section 1.20

UNIT III

Simple Interest

Section 1.21

UNIT IV

Compound Interest

Section 1.22

UNIT V

Logarithms

Section 1.23

Text Book:

1. R.S. Aggarwal – Quantitative Aptitude – For Competitive Examinations, S.Chand & Company Ltd, Reprint 2008.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

1. A man rows to a place 48 km distant and come back in 14 hours. He finds that he can row 4 km with the stream in the same time as 3 km against the stream. The rate of the stream is:
2. How much time will it take for an amount of Rs. 900 to yield Rs. 81 as interest at 4.5% per annum of simple interest?
3. $Log_5(0) = ?$

F. Group Tasks

1. Speed of a boat in standing water is 14 kmph and the speed of the stream is 1.2 kmph. A man rows to a place at a distance of 4864 km and comes back to the starting point. Calculate the total time taken by him.
2. A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. Calculate the sum.
3. If log(64) = 1.806, log(16) = ?

THIRD YEAR

Semester – VI

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Title of the paper: Modern Algebra- II **Paper Code: 17UMT10**

A. Objectives:

The main aim of the course is to learn the concept of vector spaces, basis, Extension fields, dual spaces, inner product spaces, linear transformation, Cramer's rule problems.

B. Learning Outcomes:

On successful completion of this course students will be able to

- Define vector spaces, inner product spaces, modules.
- Describe fundamental properties of the linear transformation and matrices.
- Know the algebra of linear transformation, and definition of minimal polynomial, characteristic roots.
- Know the algebra of matrices, triangular form and theorems on matrices.

C. Syllabus:

Unit - I: Vector Spaces and Modules:

Elementary Basis Concepts - Linear Independence and Bases – Definition – Lemmas – Theorems – Examples – Dual Spaces – Inner Product Spaces – Definition – Lemmas – Theorems – Examples – Modules.

Sections : 4.1 to 4.5

Unit – II: Fields:

Extension Fields – The Transcendence of *e* - Roots of Polynomials – Constructions with Straightedge and Compass – More About Roots – The Elements of Galois Theory.

Sections: 5.1 to 5.6

Unit - III: Linear Transformations:

The Algebra of Linear Transformations – Characteristic Roots - Matrices- Definition – Lemmas – Theorems – Examples.

Sections: 6.1 to 6.3

Unit – IV: Linear Transformations(Continuation):

Canonical Forms : Triangular Form - Nilpotent Transformations – Definition- Lemmas – Theorems – Examples.

Sections: 6.4 to 6.5

Unit – V: Linear Transformations (Continuation):

Trace and Transpose - Determinants – Definitions – Properties – Theorems – Cramer's Rule- Problems.

Sections: 6.8 to 6.9

Text Book

1. Topics in Algebra by I. N. Herstein, John Wiley, New York 1975.

Reference Books

1. Modern Algebra by M. L. Santiago, Tata McGraw Hill, New Delhi, 1994.
2. A First Course in Modern Algebra by A. R. Vasishtha, Krishna PrekasanMandhir, 9, Shivaji Road, Meerut (UP), 1983.
3. Mathematics for Degree Students (B. Sc. 3 Years) by Dr. U.S. Rana, S. Chand 2012.
4. Modern Algebra by K. ViswananthaNaik, Emerald Publishers, 135, Anna Saslai, Chennai.

D. Additional web resources:

1. en.wikipedia.org/wiki 2. Wiki.answers.com 3. mathworld.wolfram.com

E. Assignments:

Assignments can be given from the following topics:

1. Inner product space 2. Characteristic roots of matrices 3. Cramer's rule

F. Groups Tasks

Two groups ideals can be given in the form of group discussion, Quiz etc. in the topics of dual space, modules, trace and transpose, and determinants.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7
(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Core Course IX : Real Analysis - II **Course Code: : 17UMT11**

A. Objective:

The main objective of the course is to learn the concept of Connectedness, completeness, compactness, calculus, and sequences and series of functions. This course aims to acquaint the students with various topics of real analysis .

B. Learning Outcomes:

On successful completion of this course students will be able to

- Define connectedness and identify connected and disconnected sets.
- Define Uniform continuity and show that given functions are uniformly continuous or not uniformly continuous.
- Define completeness and prove that a real line, equipped with the standard metric, is complete and to prove that if a sequence of continuous functions converges uniformly, when their limit is also continuous.
- Compute derivatives using the limit definition and prove basic properties of derivatives.
- State the Fundamental theorem of Calculus and to use it in proofs.
- Use the Weirstrass M – Test to check for uniform convergence of series.
- Define and distinguish between point wise and uniform convergence.

C. Syllabus

UNIT I

Connectedness, Completeness & compactness – More about open sets – connectedness - bounded sets & totally bounded sets – complete metric space.

Chapter 6: Sections 6.1 to 6.4

UNIT II

Compact metric space – Continuous functions on compact metric spaces – continuity of inverse functions – uniform continuity.

Chapter 6 : Sections 6.5 to 6.8

UNIT III

Sets of measure zero – Definition of the Riemann integral – Existence of the Riemann integral- properties of the Riemann integral – Derivatives.

Chapter 7: Sections 7.1 to 7.5

UNIT IV

Rolle's theorem – The law of the mean – Fundamental theorems of calculus – Improper integrals – Improper integrals(continued).

Chapter 7 : Sections 7.6 to 7.10

UNIT V

Pointwise convergence of sequences of functions – Uniform convergence of sequence of functions – Consequence of uniform convergence- Convergence and uniform convergence of series functions.

Chapter 9 : Sections 9.1 to 9.4

Text Books:

1. Richard R.Goldberg – Methods of Real Analysis – Oxford & IBH, Publishing Co. Pvt. Ltd., New Delhi.

Reference Books:

1. Sterling K.Bargerian – A First course in real analysis - year of publication 2004. Springer (India) Private Limited. New Delhi
2. Tom. M. Apostel – MATHEMATICAL ANALYSIS – Year of publication 2002, Narosa publications, New Delhi.
3. M.S.Rangachari – REAL ANALYSIS Year of publication 1996 New century Book House, Chennai.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. wiki.answers.com
3. mathworld. wolfram.com 4. ects.ieu.edu.tr

E. Assignments:

1. State and prove Heine – Borel property.
2. Prove that every countable subset of R is of measure zero.
3. Show that $\int_1^\infty \frac{1}{x^2}dx$ is convergent.

F. Group Tasks

1. Calculate a value for which c for which $\frac{f(b)-f(a)}{g(b)-g(a)} = \frac{f'(c)}{g'(c)}$ for each of the following pairs of functions.
   (a) $f(x) = x, g(x) = x^2 \ \ (0 \le x \le 1)$.
   (b) $f(x) = \sin x, g(x) = \cos x \ \ (-\pi/2 \le x \le 0)$.
2. Give an example of a continuous function f such that $f(x) \ge 0,\ 0 \le x \le \infty)$ and such that $\sum_{n=1}^{\infty} f(n)$ Converges but $\int_1^\infty f(x)dx$ diverges.
3. Compute derivatives using the limit definition and prove basic properties of derivatives.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Title of the paper: Complex Analysis – II **Paper Code: 17UMA12**

A. Objective:

Complex analysis, traditionally known as the theory of functions of a complex variable, is the branch of mathematical analysis that investigates functions of complex numbers. It is useful in many branches of mathematics, including algebraic geometry, number theory, analytic combinatorics, applied mathematics as well as in physics, including the branches of hydrodynamics, thermodynamics and particularly quantum mechanics.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- Have learnt to expand the given function in terms of Taylor's and Laurent's series.
- Have knowledge about the absolute and uniform convergence of power series, continuity of sums of power series, integration and differentiation of power series and their properties.
- Have learnt the isolated singular points, residues, Cauchy's residue theorem and their properties.
- Have learnt the method of evaluation of improper integrals and their properties.
- Have knowledge in the indented paths, indentation, around a branch point, integration along a branch cut, definite integrals involving sines and cosines.

C. Syllabus

UNIT – I

Convergences of Sequences - Convergences of Series - Taylor series - Proof of Taylor's Theorem - Examples - Laurent series - Proof of Laurent's theorem - Examples.
Chapter 5: Section 44 to 48

UNIT – II

Absolute and Uniform convergence of power series - continuity of sums of power series - Integration and differentiation of power series - Uniqueness of series representations - Multiplication and Division of power series.
Chapter 5: Sections 49 to 52

UNIT – III

Isolated Singular points - Residues - Cauchy's Residue Theorem - Residue at Infinity - the Three Types of Isolated Singular points - Residues at poles - Examples - Zeros of Analytic Functions - Zeros and Poles - Behaviour of Functions Near Isolated Singular Points.
Chapter 6: Section 53 to 57

UNIT – IV

Evaluation of Improper real Integrals - Examples - Improper Integrals involving sines and cosines - Jordan's Inequality.
Chapter 6: Sections 58 to 60

UNIT – V

Indented Paths - An Indentation, around a branch point - Integration through a Branch cut - Definite Integrals Involving sines and cosines - Argument Principle - Rouche's Theorem.
Chapter 6 : Section 60 to 63 & Chapter 12: Section 105

Text Book

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications,

McGraw Hill, Inc, Fifth Edition.

Reference Books

1. Theory and Problems of Complex Variables-Murray.R.Spiegel,Schaum outline series.
2. Complex Analysis-P. Duraipandian.
3. Introduction to Complex Analysis.S. Ponnuswamy, Narosa publishers 1993.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com

E. Assignments:

Problems can be given in the following topics:
1. Convergence of series.
2. Integration and differentiation of power series.
3. Residues at poles.

F. Group Tasks

1. Discussion about the applications of the Taylor series.
2. Problems in improper integrals from Fourier analysis can be solved.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Title of the paper: Operations Research **Course Code: 17UMTE3**

A. Objective:

The main objective of the course is to enable the students to apply Mathematics in everyday situations and develop model decision making problems that involve constraints and linear programs.

B. Learning Outcomes:

On successful completion of this course students will be able to

- Formulate simple reasoning and learning optimization problems.
- Analyze a problem and can select a suitable strategy.
- Apply an appropriate method to obtain the solution to a problem.
- Manipulate the basic mathematical structures underlying these methods.
- Evaluate analytically the limitations of these methods.

C. Syllabus

UNIT I

Introduction- Definition of O.R – Origin and development of O.R. – Characteristic features of O.R. - uses and limitations of O.R – Linear Programming problem – Mathematical Formulation - Matrix form of LPP – General LPP- canonical and standard forms of LPP - Graphical solution – Simplex procedure – computational procedure.

Chapter 1: Sections 1.1 to1.2, 1.9, Chapter 2: Sections 2.1 to 2.3, 2.5, 2.6 & Chapter 3: Sections 3.1, 3.3

UNIT II

Artificial variable Techniques - surplus variables and artificial variable – Big 'M' method – Two phase method – Problems – concept of Duality – Formulation of primal – Dual pairs – Duality and simplex method – Dual simplex method – Dual simplex algorithm.

Chapter 3: Section 3.5 & Chapter 4: Sections 4.1 to 4.2, 4.5 to 4.7

UNIT III

Introduction – Mathematical formulation of the problem – Finding initial basic feasible solutions – Moving towards optimality – Degeneracy in a Transportation Problems - Unbalanced T.P. – Assignment problem – Balanced and unbalanced A.P. – Hungarian method – Degeneracy in A.P.

Chapter 6: Sections 6.1 to 6.9 & Chapter 7: Sections 7.1 to 7.3

UNIT IV

Introduction – Basic assumptions – problem with n jobs and 2 machines – problems with n jobs with 3 machines – n jobs to be operated on m machines – problems with two jobs on m machines (graphical method) – Replacement – Replacement of equipment that deteriorates gradually – Replacement of equipment that fails suddenly.

Chapter 10: Sections 10.1 to 10.5 & Chapter 19: Sections 19.1 to 19.3

UNIT V

Networks and Basic components – rules of network construction – Critical path method (CPM) – PERT – PERT calculations.

Chapter 21: Sections 21.1 to 21.7

Text Books:

1. Kanti Swarup, P.K. Gupta and Man Mohan, OPERATIONS RESEARCH, Eighth edition, Reprint 2000 – Sultan Chand & sons, New Delhi.

Reference Books:

1. S.Kalavathy – OPERATIONS RESEARCH – Second edition, year of publication 2002, Vikas publishing house, New Delhi,
2. P.K. Gupta and D.S.Hira - OPERATIONS RESEARCH year of publication 2004 second edition , S.Chand and Co, New Delhi
3. Hamdy Taha - OPERATIONS RESEARCH year of publication 1996. Prentice Hall publications, New Delhi.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. wiki.answers.com 3. mathworld. wolfram.com

E. Assignments:

Assignments can be given from the following topics:

1. Solution of L.P.P. using Simplex procedures.
2. Duality.
3. Transportation and Assignment problems.

F. Group Tasks:

1. Discussion about application of O.R.

2. Discussion on computational procedure of similar algorithms.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM - 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III B.Sc., Mathematics, VI Semester

Title of the paper: Numerical Methods **Paper Code: 17UMTE4**

A. Objective:

The aim of this course is to introduce numerical techniques that can be used on computer, rather than to provide a detailed treatment of accuracy or stability. The solution of some of the main problems of the scientific computing are introduced and their implementation and analysis are given by using interactive environments for computing and the scientific visualization.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- Use numerical methods to solve the algebraic and transcendental equations by using Bisection, Newton's method and some iterative methods.
- Have a sufficient exposure in constructing difference tables and to use Newton's forward and backward formula for interpolation in equal intervals.
- Have learnt to construct divided difference table and to use Stirling's, Bessel's and Lagrange's interpolation formula for unequal intervals.
- Have understood the numerical differentiation and numerical differentiation and numerical integration by using Newton's methods and Trapezoidal, Simpson's rule.
- Have learnt the methods like matrix inversion, Gaussian, Gauss seidel methods etc., for solving linear system of algebraic equations.

C. Syllabus

UNIT I : Solution of Numerical, Algebraic & Transcendental equations

Bisection method – Method of Successive approximation - Regula Falsi method – Newton's method – Generalized Newton's method.

Chapter 3: Sections 3.1 to 3.4

UNIT II : Solution of Simultaneous Linear Algebraic equations

Direct method- Gauss Elimination – Gauss Jordan Method – Inversion of a matrix using Gauss Elimination method – Method of Triangularization – Crout's method – iterative methods – Gauss Jacobi method – Gauss seidel method.

Chapter 4: Sections 4.1 to 4.5, 4.7 to 4.9

UNIT III : Interpolation with equal intervals

Finite difference – Forward difference – Backward Differences – Central differences – symbolic relations and separation of symbols – Newton's formula for interpolation – central difference interpolation formula – Gauss's Central difference Formula – Stirling's formula – Bessel's formula – Everett's formula(Problems only).

Chapters 5: Section 5.1, Chapter 6: Sections 6.1 to 6.3, 6.7 & Chapter 7: Sections 7.1 to 7.7

UNIT IV: Interpolation with unequal intervals

Divided differences – Divided difference table – Newton's divided difference formula – Lagrange interpolation formula for unequal intervals – Inverse interpolation (Problems only).

Chapter 8: Sections 8.1 to 8.2, 8.5, 8.7

UNIT V : Numerical differentiation & Integration

Numerical differentiation – Maximum and minimum values of a tabulated function – Numerical Integration – Trapezoidal rule – Simpson's 1/3 and 3/8 rule – Weddle's rule(Problems only).

Chapter 9 : Sections 9.1 to 9.3, 9.6 to 9.7, 9.9 to 9.11, 9.13 to 9.16

Text Books :

1. P. Kandasamy, K.Thilagavathy, K.Gunavathy, Numerical Methods, Third revised Edition, S.Chand & Company LTD, Ram Nagar, New Delhi.

Reference Books:

1. S.S. Sastry – Introductory methods of numerical Analysis 3rd edition, Prentize hall of India, New Delhi.
2. T.Veerarajan, T.Ramachandran, Numerical Methods with programs in C and C++, Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.
3. E.Balagurusamy, Numerical methods, Tata Mecgraw Hill Publishing Company Limited, New Delhi-2002.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com

E. Assignments:

1. Find the real root of the equation $x^3 + x^2 - 1 = 0$ in the interval [0, 1].
2. Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ correct to three places of decimals.
3. Solve the equations $2x + 3y + z = 9,\ x + 2y + 3z = 6,\ 3x + y + 2z = 8$ by factorization method.

F. Group Tasks:

1. Discussion about the applications of numerical methods in practical situations.
2. Solving problems by writing programs in C language.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Skill based elective course V: Quantitative Aptitude – III Course Code: 17UMTS5

A. Objective:

This syllabus aims to introduce students to use quantitative methods and techniques for effective decision-making model formulation and applications that are used in solving business decision problems.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes by tests and homework.

- An ability to calculate area.
- An ability to calculate volume and surface area.
- An ability to calculate races and games of skill
- An ability to calculate Calendar
- An ability to calculate clocks

C. Syllabus

UNIT I

Area

Section 1.24

UNIT II

Volume & Surface Areas

Section 1.25

UNIT III

Races & Games of Skill

Section 1.26

UNIT IV

Calendar

Section 1.27

UNIT V

Clocks

Section 1.28

Text Book:

1. R.S. Aggarwal – Quantitative Aptitude – For Competitive Examinations, S.Chand & Company Ltd, Reprint 2008.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

1. An error 2% in excess is made while measuring the side of a square. What is the percentage of error in the calculated area of the square?
2. A can run 224 metre in 28 seconds and B in 32 seconds. By what distance A beat B?
3. What will be the day of the week 15th August, 2010?

F. Group Tasks

1. A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. The area of the lawn is 2109 sq. m. what is the width of the road?
2. At a game of billiards, A can give B 15 points in 60 and A can give C to 20 points in 60. How many points can B give C in a game of 90?
3. On what dates of April, 2001 did Wednesday fall?

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

III Year B.Sc., Mathematics, VI Semester

Skill based elective course VI: Quantitative Aptitude – IV Course Code: 17UMTS6

A. Objective:

This syllabus aims to introduce students to use quantitative methods and techniques for effective decision-making model formulation and applications that are used in solving business decision problems.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes by tests and homework.

- An ability to calculate stocks and shares.
- An ability to calculate permutation and combinations.
- An ability to calculate probability
- An ability to calculate true discount and banker's discount
- An ability to calculate heights and distances

C. Syllabus

UNIT I

Stocks & Shares

Section 1.29

UNIT II

Permutation & Combinations

Section 1.30

UNIT III

Probability

Section 1.31

UNIT IV

True Discount & Banker's Discount

Section 1.32

UNIT V

Heights & Distances

Section 1.34

Text Book:

1. R.S. Aggarwal – Quantitative Aptitude – For Competitive Examinations, S.Chand & Company Ltd, Reprint 2008.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

1. In a simultaneous throw of two coins, the probability of getting at least one head is ?
2. The present worth of Rs. 2310 due 2 ½ years hence, the rate of interest being 15% per annum, is ?
3. The true discount on a bill of Rs. 540 is Rs. 90. The banker's discount is ?

F. Group Tasks

1. Two cards are drawn at random from a pack of 52 cards. What is the probability that either both are black or both are queens ?
2. There are two temples, one on each bank of a river, just opposite to each other. One temple is 54 m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are 30^0 and 60^0 respectively. Find the width of the river and the height of the other temple?
3. A man on the top pf a tower, standing on the seashore finds a boat coming towards him takes 10 minutes for the angle of depression to change from 30^0 to 60^0. Find the time taken by the boat to reach the shore from this position.

ALLIED FIRST YEAR

Semester – I

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

(For B.Sc. Physics, Chemistry, Computer science, BCA and Statistics students),

I Semester, Allied Mathematics I

Title of the paper: Algebra, Calculus and Finite Differences Paper Code: 17AMT01

A. Objective:

The course is a pre-requisite for the students to learn further topics of Mathematics in their higher semesters. At the end of the course the students would develop an understanding of the appropriate role of the Mathematical concept.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Have knowledge about the formation of equations, solution of equations and handling roots.
- Be capable of identifying algebraic eigen value problem and the eigen value solutions in certain cases.
- Have learnt the methods of first difference, higher differences, construction of difference table, interpolation of missing value, Newton's forward and Newton's backward difference formula and Lagrange's interpolation formula.
- Have learnt the method of finding the solution of the radius of curvature in Cartesian coordinates and parametric coordinates.
- Have an understanding about the definite integral and their properties, Bernoulli's formula, integration by parts and reduction formula for dx.

C. Syllabus

UNIT 1: Theory of Equations

Imaginary & Irrational roots - Transformation of equations – multiplication of roots by m - Diminishing the roots of an equation – Removal of a term – Descarte’s rule of sign – problems only.

Chapter 6: Sections 4, 7 to 10, 12

UNIT II: Matrices

Definition of Characteristic equation of a matrix - Characteristic roots of a matrix - Eigen values and the corresponding Eigen vectors of matrix - Cayley Hamilton theorem (Statement only) - Verifications of Cayley Hamilton Theorem - Problems only.

Chapter 5:

UNIT III: Finite Differences

First difference - Higher differences - Construction of difference table - Interpolation of missing value - Newton's Forward and Newton's Backward difference formula (no proof) -Lagrange's Interpolation formula (no proof) - simple problems only.

Chapter 7: 7.01 to 7.24

UNIT IV: Radius of Curvature

Formula of Radius of Curvature in Cartesian coordinates, Parametric coordinates and Polar coordinates (no proof for formulae) - Problems only.

Chapter 11:

UNIT V: Integration

Definite Integral: Simple properties of definite Integrals - Bernoulli's Formula - Integration by parts - simple problems; Reduction formula for dx - simple problems.

Chapter 15: 15.54 to 15.79 & Chapter 16: 16.01 to 16.30

Text Book :

1. Dr.P.R .Vittal ,Allied Mathematics, Margham publication, Chennai-17, Reprint 2012.

Reference Book:

1. S.G.Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17,

Reprint 2011.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Integration.
2. Matrices.
3. Theory of Equations.

F. Group Tasks

1. Collect the applications of Matrices in physical sciences with examples.
2. What is the role of radius of curvature in civil engineering?

ALLIED FIRST YEAR

Semester – II

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

(For B.Sc. Physics, Chemistry, Computer science, BCA and Statistics students),

II Semester, Allied Mathematics – II

Title of the paper: Differential Equations and Laplace Transforms Paper Code: 17AMT02

A. Objective:

The knowledge of definite integrals, reduction formula and multiple integrals are needed in other areas along with the confidence to handle integrals of higher order.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Have learnt the solution procedure for Ordinary Differential Equations of first order and higher degree.
- Have learnt the methods to solve second order differential equations with constant coefficients, complementary function and particular Integral.
- Have learnt the method of formation of partial differential equations by eliminating the arbitrary constant and arbitrary functions.
- Have a sound knowledge of Laplace Transform and its properties.
- Have sufficient exposure to get the solution of certain linear differential equation using Laplace Transform and inverse Laplace Transform.

C. Syllabus

UNIT I : Ordinary Differential Equations

Differential Equations – Equations of first order and higher degree – Equation solvable for p – Solvable for y – Solvable for x – Clairaut's equation.

Chapter 22: 22.01 to 22.17

UNIT II: Second Order Differential Equations

Second Order Differential Equations with constant coefficients - Complementary function - particular Integral and Solution of the type: e^{ax}, , x^n , $\cos ax$ (or) $\sin ax$, $x\cos ax$, $x\sin ax$ - only.

Chapter 23: 23.01 to 23.31

UNIT III: Partial Differential Equations

Formation of Partial Differential Equations by eliminating the arbitrary constant and arbitrary functions - Lagrange's Linear Partial Differential Equations - Problems only.

Chapter 26: 26.01 to 26.15 & 26.44 to 26.56

UNIT IV: Laplace Transforms

Definition of Laplace Transforms - standard formula - Linearity property - Shifting property - Change of scale property - Laplace Transforms of derivatives - Problems.

Chapter 27: 27.01 to 27.23

UNIT V: Inverse Laplace Transforms

Standard formula - Elementary theorems (no proof) - Applications to solutions of second order differential equations with constant coefficients - Simple problems.

Chapter 27: 27.23 to 27.55

Text Book :

1. Dr.P.R .Vittal ,Allied Mathematics, Margham publication, Chennai-17, Reprint 2012.

Reference Book:

1. S.G.Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Solving differential equations using Laplace Transforms.
2. Second order differential equations.
3. Partial Differential Equations.

F. Group Tasks

1. In control engineering and control theory the **transfer function** is derived using the Laplace transform. Get an example from control theory and make a presentation.
2. Describe the applications of ordinary differential equations.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)

(For B.Sc. Physics, Chemistry, Computer science, BCA and Statistics students),

II Semester, Allied Mathematics - III

Title of the paper: Differentiation & Vector calculus **Paper Code: 17AMT03**

A. Objective:

Many of the general laws of nature in Physics, Chemistry, Biology and Astronomy can be expressed in the language of differential Equations which involve derivatives and hence the theory of derivatives is the most important part of Mathematics for understanding Physical Sciences. Hence on completion of the course the students are expected to have knowledge about ordinary and partial derivatives and vector differentiation, vector integration and its applications.

B. Learning Outcomes:

After the completion of the chapters the students are expected to

- Have studied how to do successive differentiation by applying Leibnitz formula.
- Have learnt about homogeneous function in partial differentiation and the Eulers theorem.
- Have studied the basics of vector calculus comprising of gradient, divergence and curl which is mostly used in the study of solenoidal and irrotational fields in physics.
- Have learnt the application of line integrals which represent the workdone in mechanics. Also surface and volume integrals and the classical theorems involving line, surface and volume integrals which would be encountered by them in higher semesters.

C. Syllabus

UNIT I

Successive differentiation – standard nth derivatives – Leibnitz formula (without proof) for nth derivative – Problems.
Chapter 8: 8.01 to 8.40

UNIT II

Partial derivatives – Euler's theorem on homogeneous function (without proof) – Problems to verify Euler's theorem – Total differential co-efficient – Problems only.

Chapter 9: 9.01 to 9.44

UNIT III

Scalar point functions – gradient of scalar point functions – vector point functions – problems only.
Chapter 28: 28.1 to 28.22

UNIT IV

Divergence of vector point functions – curl of vector point functions – solenoidal of vector – Irrotational of vector – Problems only.
Chapter 28: 28.22 to 22.51

UNIT V

Line integrals – Surface integrals & volume integrals- Gauss Divergence Theorem –Stoke's theorem- Green's theorem – (Statements only) – Problems.
Chapter 29: 29.54 to 29.141

Text Book:

1. P.R. Vittal –Allied Mathematics, Margham publications Chennai(2002_

Reference Books:

1. T.K.Manickavasagam pillai, Allied Mathematics, S.Viswanathan and Co., Chennai(1992).
2. A.Singaravelu- Allied Mathematics , Meenakshi Traders, Chennai(20002)
3. P.Duraipandian - Udayabaskaran, Allied Mathematics volume I and II, Muhil Publishers, Chennai- 28, Year of Publications 1997.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Vector Integration.
2. Finding successive differentiation using Leibnitz formula.
3. Vector differentiation

F. Group Tasks:

1. Try to use a software package to successive derivatives for standard functions and give a presentation.
2. What is the role of vector differentiation in Physics?

SECOND YEAR

Semester – III

NON –MAJOR ELECTIVE COURSE

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)
Second Year, III Semester

Non – Major Elective course – I: Quantitative Aptitude **Course Code: 17UNME1**

A. Objective:

This syllabus aims to introduce students to use quantitative methods and techniques for effective decision-making model formulation and applications that are used in solving business decision problems. This tests the grasp of elementary concepts in Mathematics and Statistics and application of the same as useful quantitative tools.

B. Learning Outcomes:

Students who successfully complete the course will provide the following outcomes:

- An ability to calculate H.C.F. & L.C.M of Numbers.
- An ability to calculate decimal fractions.
- An ability to calculate simplification.
- An ability to calculate square roots and cube roots
- An ability to calculate average

C. Syllabus

UNIT I

Operations on numbers

Section 1.1

UNIT II

H.C.F. & L.C.M of Numbers

Section 1.2

UNIT III

Decimal Fractions

Section 1.3

UNIT IV

Square roots & Cube Roots

Section 1.5

UNIT V

Average

Section 1.6

Text Book:

1. R.S. Aggarwal – Quantitative Aptitude – For Competitive Examinations, S.Chand & Company Ltd, Reprint 2008.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Simplification.
2. Square roots and cube roots.
3. Decimal fractions

F. Group Tasks

1. When (67^{67} +67) is divided by 68, the remainder is ?
2. A man has some hens and cows. If the number of heads be 48 and the number of feet equals 140, then the number of hens will be ?
3. The average of 20 numbers is zero. Of them, how many of them may be greater than zero, at the most?

SECOND YEAR

Semester – IV

NON –MAJOR ELECTIVE COURSE

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM – 7

(For the candidates admitted from the academic year 2017 – 2018 onwards)
Second year, IV Semester

Title of the paper: Non Major Elective Course – Matrix Algebra Paper Code: 17UNME2

F. Objective:

After the completion of the course the students get fundamental knowledge about the Matrices and will be able to solve the problems related to matrices.

G. Learning Outcomes:

After the completion of the chapters the students are expected to

- Add, subtract and multiply when two matrices are given.
- Find the Transpose and inverse of a given matrix.
- Gain knowledge about symmetric, skew symmetric and Hermition matrices.
- Find the rank of the matrix.
- Do problems using Cayley Hamilton theorem.

C. Syllabus

Unit I

Definition of matrices - Addition, Subtraction and Multiplication of matrices - problems only.

Chapter 6: Sections 6.1 to 6.5

Unit II

Transpose of a matrix - Adjoint of a matrix - Inverse of a matrix - Problem only.

Chapter 6: Sections 6.6 to 6.7

Unit III

Definitions of Symmetric, Skew symmetric, Hermitian and Skew Hermitian matrices –

Problem only.

Chapter 6:Sections 6.8 to 6.16

Unit IV

Rank of a matrix - Definition – Finding the rank of a matrix - Problem upto 3×3 matrix only.

Chapter 6: Section 6.25

Unit V

Characteristic equation of matrix - Cayley Hamilton Theorem(Statement only) - verification of Cayley Hamilton Theorem - Simple problems only.

Chapter 6: Section 6.51

Text Book:

1. Dr. P. R. Vittal, Allied Mathematics, Margham Publication, Chennai-17, Reprint 2012

Reference Book:

1. S.G.Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17.

D. Additional web resources:

1. en.wikipedia.org/wiki/ 2. mathworld.wolfram.com 3. wiki.answers.com

E. Assignments:

Problems can be given in the following topics:

1. Matrix addition, subtraction and multiplication
2. Rank of the matrix.
3. Verifying Cayley Hamilton theorem.

F. Group Tasks

1. Try to find the applications of matrices and give a presentation.
2. Get physical applications of rank of the matrices and give a presentation.

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