

DEPARTMENT OF MATHEMATICS
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS) – B.Sc. Mathematics
(2018–2019 Batch and onwards)

Course Code	Name of the Course	Objectives and Out Comes		Instruction Hours / Week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER – I										
18LSU101	Language –I			4	0	0	4	40	60	100
18ENU101	English	II	n, p	4	0	0	4	40	60	100
18MMU101	Calculus	I	e, l	4	0	0	4	40	60	100
18MMU102	Algebra	II	m	6	1	0	6	40	60	100
18MMU103	Logic and Sets	III	j	6	2	0	6	40	60	100
18MMU111	Calculus(Practical)	I	e	0	0	3	2	40	60	100
Semester Total				24	3	3	26	240	360	600
SEMESTER – II										
18LSU201	Language – II			4	0	0	4	40	60	100
18MMU201	Differential Equations	I	a, d, l	4	0	0	4	40	60	100
18MMU202	Theory of Equations	II	j	6	1	0	6	40	60	100
18MMU203	Real Analysis	III	d, f	6	2	0	6	40	60	100
18MMU211	Differential Equations (Practical)	I	k	0	0	3	2	40	60	100
18AEC201	Environmental Studies	I	n, o	4	0	0	4	40	60	100
Semester Total				24	3	3	26	240	360	600

DEPARTMENT OF MATHEMATICS
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS) – B.Sc. Mathematics
(2018–2019 Batch and onwards)

PROGRAM OUTCOMES (POs)

- a. Familiarize the student's physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problems.
- b. Acquire insight into the classifications of mathematical models stating examples and the features of good models.
- c. Analyze the motion of particles under the influence of various forces.
- d. Gear up with rigorous mathematical proofs of basic results in analysis.
- e. Acquire knowledge about the line integral and its geometrical applications.
- f. Familiarize some fundamental results and techniques from the theory of groups.
- g. Application of integration in various fields.
- h. Understanding of common numerical methods and how they are used to obtain approximate solutions to intractable mathematical problems.
- i. Analyze and resolve the conflicts of economic situations.
- j. Estimates and check mathematical results for reasonableness.
- k. Ability to formulate mathematical structure for computer and communication systems.
- l. Acquire knowledge about differential equations and integrating factor, separable equations and its applications.
- m. Enrich the facts on functions, relations and systems of linear equations.
- n. An ability to function effectively on teams to accomplish a common goal.
- o. An understanding of professional, ethical, legal, security and social issues and responsibilities.
- p. An ability to communicate effectively with a range of audiences.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- q. Ability to solve diverse situation problems in physics, engineering and other science fields.
- r. Ability to think in a conceptual, analytical and logical manner.
- s. Formulation and evaluation of appropriate mathematical models to optimize the real life problems.

PROGRAM EDUCATIONAL OUTCOME (PEOs)

PEO I : To enrich the students to solve numerous of physical problems in engineering and biological models.

PEO II : To stimulate the skills needed to pursue careers in education, business and / or industry.

PEO III : To develop the professional and managerial skills, especially in areas requiring the application of quantitative skills.

MAPPING OF POs AND PEOs

POs	a	b	c	d	e	f	g	h	I	j	k	l	m	n	o	p	q	r	s
PEO I	X	X	X				X	X	X					X	X	X	X		X
PEO II				X	X	X				X		X	X		X		X		
PEO III	X								X	X	X					X		X	X

பகுதி - I, தமிழ்

முதல் பருவம்

18LSU101 :

தமிழ் முதல் தாள்

4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பொது நோக்கம்

- கற்றல் வழி கருத்து வெளிப்பாட்டுத் திறனை அதிகரித்தலும், சிந்தித்தலை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல். மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

□□□□□ □□□□□□ □□□□□ □□□□□□□□□□

□□□□-I □□□□

□□□□□□ □□□ □□□□□□ □□□□□□□□□□

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

□□□□ - I : □□□□□□ □□□□□□□□□□ :

(10)

□□□□□□□□)

கல்வி : மகாகவி பாரதியார் - சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம்பிள்ளை-ஒற்றுமையே உயிர்நிலை.

மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் - மலையாளக் காற்று.

சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.

பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் - புதையுண்ட வாழ்க்கை.

□□□□ - II : □□ □□□□□□□□ :

(8)

□□□□□□□□)

18ENU101

ENGLISH

Semester – I
4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0

Marks: Internal: 40

External: 60 Total: 100
End Semester Exam: 3 Hours**Course Objectives**

This course enables

- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To provide aesthetic pleasure through literature.

Course Outcomes (COs)

Communication skills will get developed.

Genres of literature will give moral values of life.

UNIT - I : PROSE

1. Morals in the Indian Context - Francis Nicholas Chelliah
2. How Comic Books help us to relive our Childhood - Benoit Peeters
3. Let's Do What India Needs From Us -Dr.A.P.J. Abdul Kalam

UNIT - II : POEM

1. The Stolen Boat - William Wordsworth
2. Telephone Conversation- Wole Soyinka
3. A River - A.K. Ramanujan

UNIT - III : SHORT STORIES

1. Rapunzel - Brothers Grimm
2. The Ant and The Grasshopper- W. Somerset Maugham
3. The Nightingale and the Rose - Oscar Wilde.

UNIT – IV : DRAMA

1. The Merchant of Venice- Act 4-Scence 1
2. The Death Trap- Saki

UNIT – V : GRAMMAR AND COMPOSITION

- GRAMMAR:
1. Tenses
 2. Articles
 3. Auxiliaries (Primary and Modal)
 4. Tag Questions

Composition:

1. Reading to Comprehend
2. Letter Writing
3. Resume Writing
4. General Essay

Prescribed Text: Reminisce, Published by the Department of English, Karpagam Academy of Higher Education.

Suggested Reading: Hewings Martin, 1999 Advanced English Grammar, Cambridge University Press.

18MMU101	CALCULUS	Semester – I 4H – 4C
Instruction Hours / week: L: 4 T: 0 P: 0	Marks: Internal: 40	External: 60 Total: 100 End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- The concepts of essentials of concavity, inflection points and its geometrical applications.
- The Higher order derivatives and its applications in business, economics and life sciences.

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Understand the concepts of Linear, quadratic, power, polynomial, algebraic, rational, trigonometric, exponential, hyperbolic and logarithmic functions.
2. Explore the concept of reduction formula and calculate limits in indeterminate forms by a repeated use of L'Hospital rule.
3. Use single and multiple integration to calculate the arc length, area and volume.
4. Understand the techniques of sketching conics and properties of conics.
5. Acquire the knowledge on application of vector functions.

UNIT – I

DIFFERENTIAL CALCULUS

Hyperbolic functions, higher order derivatives, Leibniz rule and its applications to problems of type $e^{ax+b}\sin x$, $e^{ax+b}\cos x$, $(ax+b)^n\sin x$, $(ax+b)^n\cos x$.

UNIT II

INTEGRAL CALCULUS

Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin nx \, dx$, $\int \cos nx \, dx$, $\int \tan nx \, dx$, $\int \sec nx \, dx$, $\int \log x^n \, dx$, $\int \sin^n x \cos^m x \, dx$. Curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital's rule, applications in business, economics and life sciences.

UNIT III

APPLICATIONS OF INTEGRATION

Volumes by slicing, disks and washers methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution.

UNIT IV

CURVE SKETCHING

Concavity and Inflection points, asymptotes. Techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

UNIT V

VECTOR FUCTIONS

Introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions, tangent and normal components of acceleration, modeling ballistics and planetary motion, Kepler's second law.

SUGGESTED READINGS

1. Thomas G.B., and Finney R.L., (2008). Calculus, Ninth Edition, Pearson Education, Delhi.
2. Anton H., Bivens I., and Davis S.,(2017). Calculus, Tenth Edition, John Wiley and Sons (Asia) P. Ltd., Singapore.
3. Strauss M.J., Bradley G.L.,and Smith K. J., (2007). Calculus, Third Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.
4. Courant R., and John F., (2000). Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York.

18MMU102	ALGEBRA	Semester – I 7H – 6C
Instruction Hours / week: L: 6 T: 1 P: 0	Marks: Internal: 40	External: 60 Total: 100 End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- The functions, relations, systems of linear equations and linear transformations.
- How to identify, evaluate and simplify algebraic expressions using the correct operations.
- The basic concepts of linear algebra.

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Know about the basic concepts of set theory.
2. Describe the categories of functions.
3. Understand the algorithms on operation.
4. Use matrix operations to solve system of linear equations.
5. Learn how to find characteristic equation, eigen value and eigen vector for matrix.

UNIT I

BASICS OF SETS

Polar representation of complex numbers, n th roots of unity, De Moivre's theorem for rational Indices and its applications. Sets –Finite and infinite sets-Equality sets-Subsets-Comparability - Proper subsets-Axiomatic development of set theory-Set operations.

UNIT II

FUNCTIONS

Equivalence relations, Functions, Composition of functions, Invertible functions, One to one Correspondence and cardinality of a set, Well-ordering property of positive integers.

UNIT III

DIVISIBILITY AND CONGRUENCE RELATIONS

Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, Statement of Fundamental Theorem of Arithmetic.

UNIT IV

SYSTEM OF LINEAR EQUATIONS

Systems of linear equations, row reduction and echelon forms, vector equations, the matrix equation $Ax=b$, solution sets of linear systems, applications of linear systems, linear

independence.

UNIT V

LINEAR TRANSFORMATIONS

Introduction to linear transformations, matrix of a linear transformation, inverse of a matrix, characterizations of invertible matrices. Subspaces of \mathbb{R}^n , dimension of subspaces of \mathbb{R}^n and rank of a matrix, Eigen values, Eigen Vectors and Characteristic Equation of a matrix.

SUGGESTED READINGS

1. Titu Andreescu., and Dorin Andrica,(2006). Complex Numbers from A to Z, Birkhauser. Library of Congress Cataloging-in-Publication Data Andreescu, Titu .
2. Edgar G. Goodaire and Michael M. Parmenter, ,(2015). Discrete Mathematics with Graph Theory, 3rd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint.
3. David C. Lay., (2008). Linear Algebra and its Applications, Third Edition, Pearson Education Asia, Indian Reprint.
4. Kenneth Hoffman., Ray Kunze., (2015).Linear Algebra, Second edition, Prentice Hall of India Pvt Ltd, New Delhi.

18MMU103

LOGIC AND SETS

Semester – I

8H – 6C

Instruction Hours / week: L: 6 T: 2 P: 0

Marks: Internal: 40

External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- First-order formula of predicate logic is a tautology using a natural-deduction style formal system.
- The formal definitions of predicates, operations on sets and pertaining to relations.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Acquire the knowledge about propositions, conjunction, disjunction, logical equivalences and counting principle.
2. Identify between binding variables and negations.
3. Use the language of set theory, interpreting issues in different areas of mathematics.
4. Know the concepts and methods of mathematical logic.
5. Mastery in the concepts of relations.

UNIT I**LOGIC AND CONNECTIONS**

Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

UNIT II**PROPOSITIONAL EQUIVALENCE**

Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

UNIT III**SETS**

Subsets, Set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets.

UNIT IV**FINITE SETS AND COUNTING PRINCIPLE**

Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set. Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections.

UNIT V**RELATIONS**

Product set, Composition of relations, Types of relations, Partitions. Equivalence Relations with example of congruence modulo relation, Partial ordering relations, n-ary relations.

SUGGESTED READINGS

1. Grimaldi R.P.,(2004). Discrete Mathematics and Combinatorial Mathematics, Pearson Education, Pvt.Ltd, Singapore.
2. Bourbaki .N(2004),Theory of sets, Springer Pvt Ltd, Paris.
3. Halmos P.R.,(2011). Naive Set Theory, Springer Pvt Ltd, New Delhi.
4. Kamke E., (2010).Theory of Sets, Dover Publishers, New York.

18MMU111

CALCULUS (PRACTICAL)

Semester – I

3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3

Marks: Internal: 40

External: 60 Total: 100
End Semester Exam: 3 Hours**Course Objectives**

This course enables the students to learn

- To demonstrate comprehension in relevant area of calculus
- Problem solving through (computer language) programming.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Familiarize with the programming environment.
2. Acquire the problem solving skills through computer programming.
3. Understand to write diversified solutions using programming language.

List of Practical (Any 8 programs)

1. Plotting of graphs of function e^{ax+b} , $\log(ax+b)$, $1/(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $|ax+b|$ and to illustrate the effect of a and b on the graph.
2. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.
3. Sketching parametric curves (Eg. Trochoid, cycloid, epicycloids, hypocycloid).
4. Obtaining surface of revolution of curves.
5. Tracing of conics in cartesian coordinates/ polar coordinates.
6. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, hyperbolic paraboloid using cartesian coordinates.
7. Matrix addition.
8. Matrix multiplication.
9. Inverse of a matrix.
10. Transpose of a matrix

பகுதி - I, தமிழ்

இரண்டாம் பருவம்

18LSU201

தமிழ் இரண்டாம் தாள்

4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பொது நோக்கம்

- கற்றல் வழி கருத்து வெளிப்பாட்டுத் திறனை அதிகரித்தலும், சிந்தித்தலை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல். மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

□□□□□□ □□□□□□ □□□□□□ □□□□□□□□□□

□□□□-I □□□□

□□□□□□ □□□□ □□□□□□□□□□□□

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	I	4	3	40 / 60	100	4

அலகு - I: பக்தி இலக்கியம்

(7

□□□□□□□)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம், வளர்ச்சி, வரலாறு.

1. சைவம் - பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. வைணவம் - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

□□□□ - II : □□□□ □□□□□□□□ : □□□□□□□□

(14

□□□□□□□)

சங்க இலக்கியங்கள் அறிமுகம்

அ). எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த - பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7,

செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10,

ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொட கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி

- 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –

பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின்

சிறப்பு

முருகன் இருப்பிடங்கள் – ‘சிறுதினை மலரொடு’

என்பதிலிருந்துதொடங்கி,

‘அறிந்தவாறே’ என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – ‘தெய்வம் சான்ற’

என்பதிலிருந்து தொடங்கி,

‘நல்குமதி’ என்பது வரையிலான தொடர்கள்: 286-295.

□□□□ - III : □□□□□□□□

(6

□□□□□□□□)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின்

சிறப்பு:

‘நாகநீள் நகரொடு’ என்பதிலிருந்து தொடங்கி,

‘கண்ணகி என்பாண் மன்னோ’ என்பது வரையிலான

தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன்

கண்ணகிக்குக் கோயில் எடுத்தல்: ‘அருந்திறலரசர்’

என்பதிலிருந்து தொடங்கி,

‘மன்னவரேறென்’ என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில்

தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார்

கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது

வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி,

'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

□□□□ – IV : □□□□□□□□

(8

□□□□□□□□)

1. குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. நகரம் – சுஜாதா

□□□□- V : □□□□□□□□□□

(5

□□□□□□□□)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை எழுதுதல்)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு.

கற்பகம் பல்கலைக்கழகத் தமிழ்த்துறை வெளியீடு.

18MMU201

DIFFERENTIAL EQUATIONS

Semester – II

4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0

Marks: Internal: 40

External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- First order exact differential equations, linear homogeneous and non homogeneous equations of higher order with constant coefficients.
- The complete solution of a non-homogeneous differential equation with constant coefficients by the method of undetermined coefficients.
- The transform of a periodic function.
- The applications of the inverse Laplace transform.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the concepts of explicit, implicit and singular solutions of a differential equation.
2. Acquire knowledge on linear and bernoulli's equaitons.
3. Know the concepts of population model.
4. Understand the method of solving differential equation using variation of parameters.
5. Identify the applications of differential equations.

UNIT I**DIFFERENTIAL EQUATIONS**

Differential equations and mathematical models. General, particular, explicit, implicit and singular solutions of a differential equation.

UNIT II**TYPES OF DIFFERENTIAL EQUATIONS**

Exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equation and Bernoulli equations, special integrating factors and transformations.

UNIT III**SECOND ORDER LINEAR EQUATIONS**

General solution of homogeneous equation of second order, principle of super position for homogeneous equation, Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, method of undetermined coefficients, method of variation of parameters.

UNIT IV**LAPLACE TRANSFORMS**

Definition-Sufficient conditions for the existence of the Laplace Transform, Laplace Transform of periodic functions- Some general theorems-Evaluation of integrals using Laplace Transform.

UNIT V**INVERSE LAPLACE TRANSFORMS**

Solving ordinary differential equations with constant coefficients using Laplace Transforms- Solving a system of differential equations using Laplace Transforms.

SUGGESTED READINGS

1. Ross S.L., (2016). Differential Equations, Third Edition, John Wiley and Sons, India.
2. Martha L Abell., and James P Braselton., (2004). Differential Equations with MATHEMATICA, Third Edition, Elsevier Academic Press.
3. Sneddon I.,(2006). Elements of Partial Differential Equations, McGraw-Hill, International Edition, New Delhi.

18MMU202

THEORY OF EQUATIONS

Semester – II

7H – 6C

Instruction Hours / week: L: 6 T: 1 P: 0

Marks: Internal: 40

External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- The solution of Reciprocal and Binomial Equations and properties of the derived functions.
- About the relations between the roots and coefficients,

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Learn about the properties of polynomials.
2. Find positive, negative and imaginary roots using Descartes rule.
3. Identify the relation between coefficients of the equation and its roots.
4. Familiarize about the transformations of equations.
5. Know about the algebraic solutions of cubic and biquadratic equations.

UNIT I**GENERAL PROPERTIES OF POLYNOMIALS**

Theorem relating to polynomials when the variable receives large values, similar theorem when the variable receives small values. Continuity of a rational integral function - Form of the quotient and remainder when a polynomial is divided by a Binomial - Tabulation of functions - Graphic representation of a polynomial - Maximum and minimum values of polynomials

UNIT II**GENERAL PROPERTIES OF EQUATIONS**

Theorems relating to the real roots of equations - Existence of a root in the general equation. Imaginary roots - Theorem determining the number of roots of an equation.

Descartes' rule of signs for positive roots - Descartes' rule of signs for negative roots - Use of Descartes' rule in proving the existence of imaginary roots - Theorem relating to the substitution of two given numbers for the variable.

UNIT III**RELATIONS BETWEEN THE ROOTS AND COEFFICIENTS**

Theorem - Applications of the theorem - Depression of an equation when a relation exists between two of its roots - The cube roots of unity - Symmetric functions of the roots – Examples - Theorems relating to symmetric functions - Examples.

UNIT IV**TRANSFORMATION OF EQUATIONS**

Roots with signs changed - Roots multiplied by a given quantity - Reciprocal roots and reciprocal equations - To increase or diminish the roots by a given quantity - Removal of terms - Binomial coefficients.

Solution of reciprocal and binomial equations: Reciprocal equations - Binomial equations. Propositions embracing their leading general Properties - The special roots of the equation - Solution of binomial equations by circular functions - Examples.

UNIT V**ALGEBRAIC SOLUTION OF THE CUBIC AND BIQUADRATIC**

The algebraic solution of the cubic equation - Application to numerical equations - Expression of the cubic as the difference of two cubes - Solution of the cubic by symmetric functions of the roots – Examples .

Properties of the Derived Functions: Graphic representation of the derived function - Theorem relating to the maxima and minima of a polynomial - Rolle's Theorem. Corollary - Constitution of the derived functions

SUGGESTED READINGS

1. Burnside W.S., and Panton A.W.,(1954). The Theory of Equations, Eighth Edition, Dublin University Press.
2. Leonard Eugene Dickson (2012). First Course in the theory of Equations., J. Wiley & sons, London: Chapman & Hall, Limited, New York.
3. Turnbull,H.W (2013)., Theory Of Equations, Fourth Edition, Published In Great Britain Bt, Oliver And Boyd Ltd., Edinburgh.
4. James Víctor Uspensky., (2005). Theory of Equations, McGraw-Hill Book Co, New York.
5. Mac Duffee C.C., (1962). Theory of Equations, John Wiley & Sons Inc., New York.

18MMU203

REAL ANALYSIS

Semester – II
8H – 6C

Instruction Hours / week: L: 6 T: 2 P: 0

Marks: Internal: 40

External: 60 Total: 100
End Semester Exam: 3 Hours**Course Objectives**

This course enables the students to learn

- About the extreme points, Root test, Ratio test.
- The alternating series, and series of functions.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand about the categories of sets.
2. Acquire the knowledge on limits and convergence of sequences.
3. Know the types of test of convergence for series.
4. Familiarize about the basic theorems on monotone sequences.
5. Know about the radius of convergence.

UNIT I**REAL NUMBERS SYSTEM**

Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , intervals.

UNIT II**SEQUENCES**

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Limit of a sequence. Limit Theorems. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

UNIT III**SERIES**

Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.

UNIT IV**MONOTONE SEQUENCES**

Monotone Sequences, Monotone Convergence Theorem. Subsequences, Divergence Criteria, Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion. Concept of cluster points and statement of Bolzano -Weierstrass theorem.

UNIT V**SEQUENCE AND SERIES OF FUNCTIONS**

Sequence of functions, Series of functions, Point wise and uniform convergence. M-test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

SUGGESTED READINGS

1. Bartle R.G. and Sherbert D. R., (2013). Introduction to Real Analysis, John Wiley and Sons (Asia) Pvt. Ltd.
2. Fischer E., (2012). Intermediate Real Analysis, Springer Verlag.
3. Ross K.A., (2003).Elementary Analysis- The Theory of Calculus Series - Undergraduate Texts in Mathematics, Springer Verlag.
4. Apostol T. M., (2010). Calculus (Vol.II), John Wiley and Sons (Asia) P. Ltd.
5. Goldberg R.,(2012). Methods of Real Analysis, Oxford and IBH publishing Co. Pvt. Ltd. New Delhi.

18MMU211

DIFFERENTIAL EQUATIONS (PRACTICAL)

Semester – II

3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3

Marks: Internal: 40

External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- Problem-solving through programming.
- Hands-on training using lab components.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Demonstrate comprehension in fundamental topics of computing, algorithms, computer organization and software systems.
2. Have applied knowledge of areas of computing to create solutions to challenging problems, including specify, design, implement and validate solutions for new problems.
3. Be aware of current research activity in computing through activities including reading papers, hearing research presentations, and successfully planning and completing an individual research project in computing or its application.

List of Practical (Any 8 programs)

1. Plotting of second order solution family of differential equation.
2. Growth model (exponential case only).
3. Decay model (exponential case only).
4. Lake pollution model (with constant/seasonal flow and pollution concentration).
5. Case of single cold pill and a course of cold pills.
6. Limited growth of population (with and without harvesting).
7. Predatory-prey model (basic volterra model, with density dependence, effect of DDT, two prey one predator).
8. Plotting of recursive sequences.
9. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.
10. Study the convergence/divergence of infinite series by plotting their sequences of partial sum.
11. Cauchy's root test by plotting nth roots.
12. Ratio test by plotting the ratio of nth and $(n+1)^{\text{th}}$ term.

18AEC201

ENVIRONMENTAL STUDIES

Semester – II

4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0

Marks: Internal: 40

External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

This course enables the students to learn

- To know about various renewable and nonrenewable resources of the region.
- To make appropriate judgments and decisions for the protection and improvement of the earth.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Create the awareness about environmental problems among people.
2. Develop an attitude of concern for the environment.
3. Motivate the public to participate in environment protection and improvement.

UNIT I**ENVIRONMENT**

Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

UNIT II**NATURAL RESOURCES - RENEWABLE AND NON-RENEWABLE RESOURCES**

Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

UNIT III**BIODIVERSITY AND ITS CONSERVATION**

Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV**ENVIRONMENTAL POLLUTION**

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Floods, earthquake, cyclone and landslides.

UNIT V**SOCIAL ISSUES AND THE ENVIRONMENT**

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case

studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

SUGGESTED READINGS

1. Tripathy.S.N., and Sunakar Panda., (2010). Fundamentals of Environmental Studies, Third Edition, Vrianda Publications Private Ltd, New Delhi.
2. Arvind Kumar., (2004). A Textbook of Environmental Science, APH Publishing Corporation, New Delhi.
3. Verma P.S., and Agarwal V.K., (2015). Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.
4. Anubha Kaushik, C.P.Kaushik, (2005). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.
5. Singh, M.P., B.S. Singh and Soma S. Dey, (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
6. Daniel B.Botkin and Edward A. Keller., (2014). Environmental Science, John Wiley and Sons, Inc., New York.
7. Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi, India