Don Bosco College of Arts and Science, Keela Eral

Department of mathematics

Syllabus-2020-2021 onwards

Semester – VI
Core – IX

Paper – XIII (5hrs/week)

COMPLEX ANALYSIS   (75 hours)   (AMMA61)

Objectives:

- ❖ To understand the concepts of complex variables.
- ❖ To learn about elementary transformations in complex variables.

Course Learning Outcomes: It enables the students to

1. know the concept of complex integration, Cauchy integral formula.
2. understand the importance of singularity and residues.

UNIT – 1: (Analytic functions)

Functions of a complex variable – Derivatives – Cauchy – Riemann equations –sufficient conditions– Polar form– Analytic functions– Harmonic functions**.**

UNIT – 2: (Integrals)

Definite integrals – Contours – Cauchy – Goursat theorem – anti-derivatives and independence of path–Cauchy Integral formula – Morera's theorem.

UNIT – 3: (Series)

Taylor's series – Examples – Laurent's series – Zeros of analytic functions –Residues–Residue theorem–Principal part of functions–Residues at poles.

UNIT – 4: (Evaluation of Integrals)

Evaluation of improper real integrals – improper integrals involving sines and cosines – Definite integrals involving sines and cosines**.**

UNIT – 5: (Transformations)

Basic properties–Bilinear maps–fixed points.

Text Book:

- Arumugam.S and T. Issac–"Complex Analysis" –Scitech Publishing House–Chennai,(2002).

Books for Reference :

1. Churchill.R.V. and J.W.Brown–"Complex variables and Applications"– McGraw Hill International Editions – IX Edition,2013.
2. Ponnuswamy.S "Foundations of Complex Analysis", Narosa Publication House, NewDelhi, II Edition 2005.
3. Duraipandian.P and Lakshmi Duraipandian–"ComplexAnalysis"–Emerald Publications, Chennai (2001).

Core – X

Paper – XIV (5hrs/week)

GRAPH THEORY (75 hours)   (AMMA62)

Objectives:

- ❖ To introduce the notion of graph theory and its applications
- ❖ To learn the techniques in graph theory

Course Learning Outcomes: It enables the students to

1. know different types of graphs.
2. understand the concepts of walks, trails and paths.

UNIT – 1:

Definition and examples of graphs – degrees - subgraphs – isomorphism – independent sets and coverings – matrices – operation on graphs.

UNIT – 2:

Degree sequences – graphic sequences – walks – trails and paths – connectedness and components–connectivity.

UNIT – 3:

Eulerian graphs – Hamiltonian graphs – characterization of trees – centre of a tree**.**

UNIT – 4:

Definition and properties of planar graphs – chromatic number and chromatic index.

UNIT – 5:

Chromatic polynomials – definition and basic properties of digraphs – paths and connectedness in digraphs**.**

Text Book:

Arumugam.S & S.Ramachandran–Invitation to graph Theory, Scitech publications,Chennai, 2002.

Books for reference:

- Kumaravelu.S and Susheela Kumaravelu – Graph theory- Nagercoil,2002.
- Narasingh Deo–Graph theory with application to engineering and computer science, Prentice – Hall of India pvt.Ltd., NewDelhi,1979.

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Semester – VI

Core – XI

Paper – XV (4hrs/week)

NUMBER THEORY   (60 hours)   (AMMA63)

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Objectives:

- ❖ To highlight the beauties in the world of numbers
- ❖ To prepare the students for coding through congruence

Course Learning Outcomes: It enables the students to

1. learn Fermat's Theorem & Wilson's Theorem.
2. understand the importance of Division algorithm.

UNIT -1:

Peano's Axioms – Mathematical induction – The Binomial Theorem – Early Number Theory.

UNIT – 2:

Division Algorithm – GCD – Euclidean Algorithm –The Diaphantine Equation ax+by=c.

UNIT – 3:

The fundamental Theorem of Arithmetic – The Sieve of Eratosthenes – The Goldbach conjecture.

UNIT – 4:

Basic properties of congruences – Linear congruence and the Chinese Remainder Theorem.

UNIT – 5:

Fermat's Theorem – Wilson's Theorem – The Fermat – Kraitchik Factorization Method.

Text Book:

David.M.Burton-ElementaryNumberTheory-Tata McGraw Hill Education Pvt. Ltd- (SixthEdition)-2007.

Books for Reference :

- Ivan Nivenand. H, Zuckerman-An Introduction to Theory of Numbers,Cambridge University Press -2019.
- Kumaravelu.S, and Susheela Kumaravelu -Elements of Number Theory-Nagercoil,2002.

Semester – VI

Core – XII

Paper – XVI (4hrs/week)

DYNAMICS   (60 hours)   (AMMA64)

Objectives:

- ❖ To provide a basic knowledge of the behavior of objects in motion
- ❖ To develop a working knowledge to handle practical problems

Course Learning Outcomes: It enables the students to

1. develop the Knowledge in Projectiles.
2. learn about the differential equation of central orbit.

UNIT – 1:

Projectiles – Equation of path – range–maximum height – time of flight – range on an inclined plane   - problems.

UNIT – 2:

Collision of elastic bodies – Laws of impact – direct and oblique impact-Problems.

UINT – 3:

Simple Harmonic Motion (SHM) in a straight line- Geometrical representation –composition of SHM of the same period in the same line and along two perpendicular directions–problems**.**

UNIT – 4:

Motion under the action of central forces – velocity and acceleration in polar co-ordinates–problems.

UNIT – 5:

Differential Equation of central orbit - pedal equation of central orbit – problems to find the law of force towards the pole when the orbit is given.

Text Book:

Venkatraman, M.K.- A Text Book on Dynamics, Agasthiar Publication, Trichy,2020.

Books for Reference:

1. Narayanan, S-Dynamics, S.Chand & company, 16th Edition,1986, NewDelhi.
2 . Duraipandian.P, LaxmiDuraipandian and Muthamizh Jayaprgasam-Mechanics S.Chand & Company (2003).
3. I.Rajeswari –Mechanics- Saras Publication,Nagercoil,(2016).

Paper – XVII (4hrs/week)
NUMERICAL METHODS (60 hours) (AMMA65)

Objectives:

❖ To introduce the finite differences
❖ To solve numerical problems by different methods

Course Learning Outcomes: It enables the students to

1. recognize numerical differentiation and integration.
2. understand the concepts of solving various numerical problems by using different methods.

UNIT – 1:

Solution of Numerical algebraic and Transcendental Equations : Bisection method– Newton's method. Criterion of order of convergence of Newton's method. Regula False method – Gauss elimination – Gauss Jacobi – Gauss Seidal method.

UNIT – 2:

Finite Difference: First and higher order differences – Forward and backward differences – Properties of Operator – Differences of a polynomial –Factorial Polynomial.

UNIT – 3:

Interpolation: Newton's Forward–backward, Gauss forward–backward interpolation formula– Bessel's formula. Divided differences – Newton's divided difference formula – Lagrange's interpolation formula.

UNIT -4:

Numerical Differentiation and Integration: Newton's forward and backward differences for differentiation – Derivatives using Bessel's formula – Trapezoidal rule, Simpson's 1/3rule & 3/8rule.

UNIT – 5:

Difference Equations: Definition – order and degree of difference equation – Linear difference equation – Finding complementary function – particular Integral – simple applications.

Text Book:

Venkatraman.M.K - Numerical methods in Science and Engineering National Publishing Company - V Edition 1998.

Books for Reference:

1. Kandasamy.P.K.Thilagavathy and K.Gunavathy, Numerical Methods, S.Chand & Company Ltd. Edn. 2006.
2. Autar Kaw and Egwwn Enc Kalu – Numerical methods with Application Abidet. Autokaw.com 2nd Edtion , 2011.
3. Dr.A.Singaravelu Statistics & Numerical Methods, Meenakshi Agency (2012).

Semester – VI
Major Elective – III
Paper – XVIII (4hrs/week)
3.1 ASTRONOMY   (60 hours)   (AMMA6A)

Objectives:
- ❖ To introduce the exciting world of Astronomy to students
- ❖ To understand the movements of the celestial sphere

Course Learning Outcomes: It enables the students to

1. know the Kepler's laws of the Planetary motion.
2. study the concept of the fundamental formula of Spherical trigonometry.

UNIT – 1:

Spherical Trigonometry : Spherical triangle – The fundamental formula of Spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems.

UNIT – 2:

The Celestial Sphere: Celestial co-ordinates – Diurnal motion – Rising and setting of a star – sidereal time – circumpolar stars – Morning and evening stars - Twilight.

UNIT – 3:

Earth – length of a day – Refraction – Tangent formula – Cassini's formula – Effects of refraction.

UNIT – 4:

Geocentric parallax – Effects – Heliocentric parallax – Effects.

UNIT – 5:

Kepler's laws – verification of Kepler's laws – True anomaly, mean anomaly, Eccentric anomaly - Relation between them.

Text Book:

- Kumaravelu.S and Susheela Kumaravelu –Astronomy for degree classes, Rainbow Printers, Nagercoil (2005).

Book for Reference :

- Ramachandran.G.V –Astronomy, Mission Press, Palayamkottai,1965.

Semester – VI

Major Elective –III

Paper – XVIII (4hrs/week)

3.2 FUZZY MATHEMATICS (60 hours) (AMMA6B)

Objectives:

- ❖ To introduce fuzzy concepts to students.
- ❖ To facilitate the students to study fuzzy operations and fuzzy numbers.

Course Learning Outcomes: It enables the students to

1. form a clear idea about Fuzzy sets.
2. learn the concepts of Fuzzy operations & Fuzzy numbers.

UNIT – 1:

Crisp Sets – Fuzzy Sets – Basic Types – Basic Concepts – Characteristics and Significance of Paradigm Shift.

UNIT – 2:

Additional properties of α-cuts – representations of fuzzy sets – Extension principle for fuzzy sets**.**

UNIT – 3:

Fuzzy set operations – Fuzzy complements – Fuzzy intersections: t-norms – Fuzzy Unions: t-conforms –Combinations of operations.

UNIT -4:

Fuzzy Numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations of fuzzy numbers – Lattice of fuzzy numbers – Fuzzy Equations.

UNIT – 5:

 Fuzzy Decision Making – Individual Decision Making – Multi – person decision making – Fuzzy linear Programming.

Text Book:

GeorgeJ.Klir and BoBo Yuan–Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, 2002, New Delhi.

Book for Reference:

- GeorgeJ.KlirandTina. A.Folger–Fuzzy sets, uncertainty and Informations – Prentice Hall of India, 2003, New Delhi.

Major Elective – III

Paper – XVIII (4hrs/week)

3.3 MATHEMATICAL MODELLING   (60 hours) (AMMA6C)

Objectives:

- ❖ To study the mathematical models through ODE and difference equations.
- ❖ To train the students to develop mathematical models in real life problems.

Course Learning Outcomes: It enables the students to

1. get training to develop mathematical models in real life problems.
2. make mathematical models through O.D.E. understand the concepts of solving various numerical problem by using different methods.

UNIT – 1:

(Mathematical modeling through O.D.E(First order)):   Linear growth and Decay models – Non –linear growth and Decay models – Compartment Models – Dynamics Problems – Geometrical Problems**.**

UNIT – 2:

Population dynamics – Epidemics – Compartment Models – Economics, Medicine, Arms race, Battles and International Trade.

UNIT – 3:

(Mathematical Modelling through O.D.E.(Second order)):   Planetary motion – circular motion – Motion of satellites – Modelling through linear difference equations of second order.

UNIT – 4:

(Mathematical Modelling through difference equations):   Basic theory of difference equation with constant coefficients – Economics and Finance – Population dynamics and genetics – Probability theory.

UNIT – 5:

(Modelling through graphs):   Solutions that can be modelled through graphs - models in terms of directed graphs, signed graphs – weighted digraphs and unoriented graphs**.**

Text Book:

- • Kapur.J.N – Treatment as in "Mathematical Modelling" New Age International Publishers, 2004.

Books for Reference :

1. Kapur.J.N–Mathematical Modelling in Biology and Medicine – East West Press – 1985.
2. Singh – Mathematical Modelling, International Book house –2003.
3. Frank R.Giordano, MauriceD.Weir and WilliamP.Fox,- A first course in mathematical modelling, Thomson Learning, London and New York, 2003.

Major Elective – IV
Paper – XIX (4hrs/week)
4.1 OPERATIONS RESEARCH – II (60 hours) (AMMA6D)

Objectives:
- ❖ To introduce Games and strategies.
- ❖ To understand networking problems.

Course Learning Outcomes: It enables the students to

1. acquire knowledge about queuing model.
2. solve life oriented problems.

UNIT – 1:

Games and Strategies: Two Person Zero sum Games – The Maximin – Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of 2xn and mx2 games– Dominance Property.

UNIT – 2:

Replacement of items that deteriorate with time – replace mentage of a machine taking money value into consideration – replacement of items that completely fail suddenly and Staffing Problems.

UNIT – 3:

Queing models: General concept and definitions – characteristics – properties of Poisson process Models(M/M/1:/FCFS),(M/M/1:N/FCFS),(M/M/S:/FCFS).

UNIT – 4:

Network scheduling by PERT/CPM: Network and basic components – Rules of Network Construction – Time Calculation in network – Critical Path Method –PERT Calculation.

UNIT – V:

Inventory Control : Introductions– Types of Inventories – Inventory decisions–Deterministic inventory Problem – EOQ problems without shortages**.**

Text Book:

KantiSwarup,P.K.GuptaandManmohan–OperationsResearch–SultanChand&Sons– 2006, 12th Edition.

Books for Reference :
- • Gupta.P.KandD.S.Hira –OperationsResearch– S.Chand & sons – VII Edition..
- • B.J.RanganathandA.S.Srikantappa–Operations Research, Yes Dee Publishing House, Chennai (2017).
- • Hillier,F.S.andG.J.Lieberman – Introduction to Operations Research, 9th Ed., Tata McGraw Hill, Singapore,2009.
- • HamdyA.Taha,-Operations Research, An Introduction,8th Ed.,Prentice–HallIndia,2006.
- • Hadley.G.- Linear Programming, Narosa Publishing House, NewDelhi,2002.

BUSINESS MATHEMATICS

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Course Objective: To acquaint students with the construction of mathematical models for Managerial decision situations. The emphasis is on understanding the concepts, formulation and interpretation.

UNIT- I: ANALYTICAL GEOMETRY

Analytical geometry – distance between two points in a plane – slope of a straight line - equation of the straight line – point of intersection – demand and supply curves (linear) – market equilibrium – break even analysis.   (15 hrs)

UNIT –II: SET THEORY

Set theory – definition – types – union, intersection, difference, and complement of sets De Morgan's Law – Venn diagram – simple set applications – Cartesian product   (15 hrs)

UNIT- III: DIFFERENTIAL CALCULUS

Differential calculus – derivative of a function – differentiation – standard forms – sum, product, quotient rule – differential coefficients of simple functions **(trigonometric functions excluded)** – function of a function rule – simple application to business using marginal concept
(15 hrs)

UNIT-IV: HIGHER ORDER DERIVATIVES

Higher order derivatives – maxima and minima – simple marketing models using profit maximization, fencing and container problems only – Integral calculus – standard forms – rules of integration – Definite integral – simple applications – finding total and average cost function – producer surplus and consumer surplus.   (15 hrs)

UNIT -V: MATRIX

Matrices – definition – types – addition, subtraction, multiplication of matrices – inverse matrix – solving a system of simultaneous linear equations using matrix inversion technique – rank of a matrix.   (15 hrs)

(Marks: Theory 40% and Problems 60%)

Reference Books:
1. Business Mathematics   – V.Sundaresan and S.D.Jeyaseelan.
2. Business Mathematics   – Navaneethan .P
3. Business Mathematics   - M. Wilson
4. Mathematics for management – G.k. Ranganath

PART III – MAJOR CORE -10
BUSINESS MATHEMATICS

Objectives
1. To provide the basic knowledge of mathematical techniques as are applicable to business.
2. To provide logical idea to find out practical solutions for the managerial problems.

Unit I: Number systems and equations

Numbers – natural – whole – rational – irrational – real. Equations – linear – quadratic – solutions of simultaneous linear equations with two or three unknowns – solutions of quadratic equations – nature of the roots – forming quadratic equation.

Unit II: Indices

Definition – Positive indices – Laws of indices – Negative indices – Zero and utility indices – Fractional indices. Logarithms – Definition – Properties of logarithms – Laws of logarithms – Common logarithm.

Unit III: Analytical geometry

Distance between two points in a plane – slope of a straight line – equation of straight line – point of intersection of two lines – applications (1) demand and supply (2) cost-output (3) break even analysis.

Unit IV: Matrices

Meaning – types – algebra of matrices – addition and subtraction – scalar multiplication – Multiplication of matrices – transpose of matrix – Determinant – minors and co-factors – inverse of a matrix – solving simultaneous linear equations using matrix method.

Unit V: Commercial arithmetic

Simple interest – Compound interest – Depreciation – Discount – true discount – Discounting a bill of exchange – Banker's discount – Banker's gain.

TextBooks
1. D.S. Sancheti& V.K. Kapoor, Business Mathematics, Sultan Chand and Sons, New Delhi.
2. M. Manoharan& C. Elango, Business Mathematics, Palani Paramount Publications, Palani.

Reference Books:
1. G.K. Ranganath, Text book of Business Mathematics, Himalaya Publishing House, Delhi.
2. D.C. Sanchetti& B.M. Agarwal, Business Mathematics, Sultan Chand and Sons, New Delhi.

BUSINESS STATISTICS

Total Credits:4

No. of Instructional Hours: 6 Hours per week

Course Objective: 1. To provide an understanding for the graduate business student on statistical concepts to include measurements of location and dispersion, regression, and correlation analysis, multiple regression and business/economic forecasting.

UNIT – I:INTRODUCTION

Nature and Scope Of Statistics – Use of Statistics In Business And Industries – Collection Of Data – Methods – Kinds of data – Relative Merits And Demerits – Graphic and Diagrammatic Representation Of Data – Bar Charts – Pie Diagram – Line Graphs – Sampling.

UNIT – II: MEASURE OF CENTRAL TENDENCY

Classification And Tabulation Of Data – Frequency Distribution Graphic Representation - Histogram, Frequency Polygon And Curve – Measures Of Central Tendency – Mean, Median – Ogive Curves, Modes, Geometric Mean And Harmonic Mean.

UNIT – III: DISPERSION

Dispersion – Purpose – Range , Quartile Deviation, Mean Deviation And Standard Deviation- Co-Efficient Of Variation.

UNIT – IV: CORRELATION AND REGRESSION

Simple Correlation and Regression – Definition - Addition and Multiplication – Probability – Simple problems.

UNIT – V: INDEX NUMBERAND TIME SERIES ANALYSIS

Index Number – Meaning And Uses, Construction Of Index Numbers – Methods Of Index Numbers – Time series – Definition – Components – Estimating the Trend and Seasonal Variations – Business forecasting - Meaning and Uses.

Reference Books:

1) Business Statistics – R.S.N.PILLAI

2) Statistical Methods – S.P.GUPTA

3) Statistics – ELHANCE .