Scheme & Syllabus
of
Interdisciplinary Core Courses offered by Physical Sciences

Department of Physical Sciences

UISH

Sant Baba Bhag Singh University

2020-21

ABOUT THE DEPARTMENT

The Physical Sciences expands our knowledge of the universe and underlines new technologies, which benefit our society. In keeping with the heritage of imparting quality education, teaching and research are the prime motive of the Department of Physical Sciences.

Department of Physical Sciences is dynamic and progressive in its development of new course initiatives. The faculty is well placed to contribute substantially to the goal of SBBSU and becoming a research oriented organization. The teaching is by way of interactive sessions between students and teachers. Our courses ensure a coherent degree structure while encouraging interdisciplinary approach.

SALIENT FEATURES OF THE DEPARTMENT

- The Department has highly qualified, young, dynamic and dedicated Faculty in various fields of Physical Sciences *viz.* Chemistry, Physics, Mathematics.
- The Department has well equipped laboratories with a number of instruments and facilities like, UV- Visible Spectrophotometer, High Speed Centrifuge, Muffle furnance, Digital water bath, Polarimeter , Turbiditimeter, AbbsRefractrometer, Digital weighing balance, Magnetic plate with stirrer, pH meter, Conductometer, Flame Photometer, colorimeter and a double distillation plant, Spring balance , Sodium Lamp Transformer **,** Young's modulus,Ultrasonic interferometer **,** Rheostat **,** Maxwell needle apparatus kit **,** Magnetic field of solenoid **,** Ballistic Galvanometer **,** Deflection and vibration Magnetometer **,** Electron spin resonance
- The Department keeps its students abreast of latest advancements in technology through ultra-modern computer facilities, e-learning, virtual labs, SWAYAM Courses as per UGC guidelines.
- The department updates curricula on a regular basis to ensure that the students keep up with the changing trends of education and research globally. The syllabi of courses are designed to equip students to qualify exams such as GATE, UGC- NET / SLET, etc.
- Student centric, ICT enabled and interactive teaching
- Students and teachers participation in International, National, State and Regional seminars and conferences.
- Curricular and the co-curricular activities are well balanced in the Teaching Learning environment to provide holistic education to the students.
- Flexiblility in course curriculum as per the needs of students & PG Programmes with Project as research component.
- The outcome based teaching model of faculty comprising of theoretical work, regular academic activities such as research projects, seminars, resource learning and hands-on laboratory work.
- Along with Industry aligned academia, expert interaction, is the key features of the department.

Why Mathematics is Important in Interdisciplinary Courses

In Engineering: Applied mathematics is often used to solve complex practical problems. And it is when used by engineers that this kind of mathematics brings about the most invaluable real world solutions to our problems.

In Commerce Courses: Commerce is mainly of Accountancy, Business Analysis, Financial Markets, Economics, Marketing, Management etc. Maths can be a great combination, wherein it sharpens calculation skills faster going further in degree times and pgs or professional courses such as icwa, cs , ca etc.

In Management Courses: Mathematics is an important part of managing business. These problems that occur on a daily basis can be effectively solved with the help of mathematical models. Hence mathematics not only helps to calculate but also analyze business problems and work upon them.

In Computer Science & Applications: Mathematics will impart a student with the art of reading, understanding and analyzing a problem before coming up with a solution. All these skills are vital when it comes to programming and computer science in general. An algorithm is a commonly used term in the field of computer science & application and technology in general.

In Agriculture/Agronomy/Botany: Firstly, mathematics has enabled farming to be more economically efficient and has increased productivity. Farmers use mathematics as a system of organization to effectively utilize their time and manage their money. Farmers use numbers everyday for a variety of tasks, from measuring and weighing, to land marking. Secondly, knowledge of mathematics is very important for the analysis of soil. It is required to measure the moisture and the acidity of the soil. These measurements will allow the farmer to decide what kinds of crops he can grow in his field, or even what kind of fertilizer he should use. Lastly, math helps us think analytically and have better reasoning abilities. Analytical thinking refers to the ability to think critically about the world around us.

Why Physics/ Chemistry is Important in Interdisciplinary Courses (Engineering)

Chemistry: Chemistry is important to produce a work force of versatile and open minded engineering professionals, who will be able to adapt to scientific and technological innovations.

Physics: It helps the study of topics such as Mechanics, Elasticity etc. helps a civil Engineer to study about a building and it's construction at molecular level and also helps in predicting the strength of a given material and structure.

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2	UIET	B.Tech	1&2	CHM107	Engineering Chemistry Practical	
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	PHYSICS FOR SISTER INSTITUTES					
1	UIET	B.Tech	1&2	PHY105	Engineering Physics	44-45
2	UIET	B.Tech	1&2	PHY107	Engineering Physics Practical	

Course Code	**MAT103-19**
Course Title	Engineering Mathematics-I
Type of course	Applied Mathematics for B.Tech-1st Sem.
L T P	4:1: 0
Credits	5
Course prerequisite	+2 with non- medical
Course Objective (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures.
Course Outcome (CO)	CO_1 Inculcate an ability to identify engineering problems" CO_2 Inculcate an ability to formulate engineering problems CO_3 Inculcate an ability to solve engineering problems

UNIT-I

Matrices: Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

UNIT-II

Multivariable Calculus (Differentiation) : Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient,curl and divergence.

UNIT-III

Vector spaces Vector Space,linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT-IV

Calculus: Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties ;Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers
2	Fourier Series and Boundary Values Problems	Churchill	McGraw Hill.
3	Complex Variables & Applications	Churchill	McGraw Hill.
4	Engineering Mathematics	Bali &lyingar	Laxmi Publication.
5	Advanced Engineering Mathematics	Wylie and Barren	Mcgrawhill,6thedition,1995
6	Advanced Engineering Mathematics	Kreyszig, John Wiley	

Course Code	**MAT104**
Course Title	Engineering Mathematics -II
Type of course	Theory (Applied Mathematics for B.Tech-2nd Sem.)
L T P	4 1 0
Credits	5
Course prerequisite	
Course Objective (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures.
Course Outcome (CO)	CO_1 Enable students to use effective mathematical tools for the solutions of differential equations that model physical processes CO_2 Enable students to derive mathematical models of physical systems. CO_3 Enable students to use tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems

UNIT I

Multivariable Calculus (Integration*)*: Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities);Triple integrals (Cartesian), orthogonal. curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT II

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. **Second order linear differential equations** with variable coefficients, method of variation of parameters, Cauchy-Euler equation

UNIT III

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties).

UNIT IV

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna Publishers, Delhi.
2	Advanced Engineering Mathematics	Jain, R.K and Iyengar, S.R.K.	Narosa Publishing Company
3	Statistical Methods	S P Gupta	Sultan Chand & sons

Course Code	**MAT 105**
Course Title	Basic Mathematics
Type of Course	Core
L T P	3 2 0
Credits	4
Course Prerequisites	Nil
Course Objectives (CO)	• to introduce the need for statistics and statistical analysis • to describe the types of data • to present descriptive statistics • to introduce the fundamental probability basis to provide experience in a quantitative research study
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Students become Capable to use limit in different concepts: differentiation & Integration CO_3 Students become Capable to use Integration to solve various Problems.

UNIT –I:

Determinant: Definition,Minors, Cofactors, Properties of Determinants , Definition of matrices Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof)

UNIT-II:

Limit, Continuity and Differentiation: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Type of Discontinuities**,** Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions.

UNIT-III:

Integration: Integral as Limit of Sum, Indefinite Integrals, Methods of Integration Substitution.

UNIT-IV:

Statistics: Measures of Central Tendency, Introduction of Mean, Median, Mode. Arithmetic Mean, Median and mode With Individual Observation, Discrete Observation and continuous Observation. Harmonic Mean. Measures of Dispersion , Range, Standard Deviation

Sr. No.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Elementary EngineeringMathematics	B.S. Grewal	S. Chand & Co.
2.	Integral Calculus	Shanti Narayan	S.Chand& Company
3.	Advanced Engineering Mathematics	H.K. Dass	S. Chand & Co., 9th Revised Edition
4.	Differential Calculus	Shanti Narayan	S.Chand& Company

Course Code	**MAT 106**
Course Title	Discrete Mathematics
Type of Course	Core
L T P	3 2 0
Credits	4
Course Prerequisites	Basics of Mathematics
Course Objectives (CO)	Throughout the course, students will be expected todemonstrate their understanding of Discrete Mathematics by being able todo each of the following: Use mathematically correct terminology and notation. Construct correct direct and indirect proofs. Apply logical reasoning to solve a variety of problems.
Course Outcome (CO)	CO_1 Enable Students to demonstrate the ability to write and evaluate a proof in Logics. CO_2 Enable Students to write an argument using logical notation and determine if the argument is or is not valid. CO_3 Enable Students to become capable to use Graphs in Networking & other engineering problems.

UNIT I

Fundamentals –sets , types of sets ,operations on sets , basic laws of set theory, sequences Logics – propositions, basic laws of prepositions , logical operations , conditional and biconditional statements ,tautologies , contradiction, methods of proof . Mathematical induction, permutations, combinations, pigeon hole principle

UNIT II

Relation and digraph- relations, types of relation, matrix of relation, product sets and partitions (ordered and unordered), hasse diagram and digraph, path in relation and digraphs, functions, types of functions

UNIT III

Graph theory- graphs(directed and undirected),types of graphs, Euler's paths and circuits, Hamiltonian paths and circuits, colorings of graphs , partially ordered sets, external elements of poset, lattices, lattices as algebraic system, finite Boolean

UNIT IV

Semi groups and monoids - Binary operations, groups, semi groups, monoids, homomorphism of semi groups and monoids, , fundamental theorem of homomorphism

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Discrete Mathematics	Seymour Lipschutz	Schaum Series
2.	Discrete Mathematics with Application	Susanna S.Epp	Thomson Brooks
3.	Discrete Mathematics and its Application	Kenneth H.Rosen	McGraw-Hill Science

Course Code	**MAT 108**
Course Title	Statistical Techniques in Computer Science
Type of Course	Theory(Compulsory)
L T P	3 2 0
Credits	4
Course Prerequisites	Basic knowledge of mathematics and statistics
Course Objectives (CO)	Students will learn about graphical methods, measures of central tendency, dispersion, probability , time series
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Inculcate an ability to identify & Solve all problems based on Probability. CO_3 Enable Students become Capable to use graphical representation of Statistical Problems.

SYLLABUS

Unit 1

Introduction of Statistics: Definitions of Statistics. Importance of statistics. Advantages and Limitations. Scope of Statistics: Computer Science, Industry, Economy, Social Science.

Unit II

Data Condensation and Graphical Methods: Collection of Data, Types of Data Attributes and variables, Construction of Frequency, Cumulative and Relative. Frequency distributions. Graphical representation of Frequency distribution: Histogram, Frequency Polygon, Frequency Curve and Cumulative Frequency curves (Ogive curves)

Unit III

Measures of Central Tendency: Concept of central tendency. Arithmetic Mean, Median, Mode. Merits and Demerits.**Measures of Dispersion**:Concept of Dispersion.:Range: Definition, Formulae and Computation for ungrouped and grouped data.Standard Deviation: Definition, Formulae and Computation for ungrouped and grouped data.Variance: Definition, Formulae and Computation for ungrouped and grouped data.Coefficient of variation: Definition, Formulae and Computation for ungrouped and grouped data.

Unit IV

Probability: Permutation and combination, Sample space, Events and Types of events. Classical definition of probability and axioms of probability. Theorems on Probability.**Correlation&Regression**:Definition of Correlation, Types of Correlation, Karl Pearson's coefficient of correlations for ungrouped data and problems. Definition of Regression. Regression equations and problems. **Analysis of Time Series**: Definition and components of time series, Measures of trends Moving average method and least square method and problems.

RECOMMENDED BOOKS

Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Fundamentals of Statistics	A.M. Gun, M.K.Gupta, B. Dasgupta	The World Press Private Limited.
2.	Statistical Methods	S.P. Gupta	McGraw Hill Education.
3.	Business Statistics	S. Shaha	B. S. Shah Prakashan
4.	Modern Elementary Statistics	J.E. Freund	Prentice-Hall
5.	Fundamentals of Applied Statistics	Gupta and Kapoor	Sultan Chand & Sons

Course Code	MAT 211
Course Title	Business Mathematics
Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	NA
Course Objectives (CO)	The aim to give an idea regarding the appropriate statistical tools used for the analysis of data.
Course Outcome (CO)	CO_1 Students become able to work with simple and compound interest, annuities, payroll preparation. CO_2 An ability use correct mathematical terminology, & notation correctly CO_3 Students become able to use the knowledge of stock & share in real life.

UNIT I:Ratio and proportion: Ratio, Types of Ratios, Operations on proportion,Equation Simple, Linear, Quadratic and Cubic Equation ,Sequences, series, progression: A.P, Properties of A.P, sum to nth Terms of an A.P, A.M,G.P, standard form of G.P, Nth Terms of G.P, Sum of nth Terms of G.P

UNIT II

Set Theory and Relations: Sets:-Elements of a set, methods of describing a set, types of sets, Operations on sets--union, intersection and difference of sets, Venn diagrams, statement problems, Associative Laws, Distributive laws, DeMorgan's laws, duality, partitioning of a set.Basic definition of relation and types of relations, graphs of relations, properties of relations, (domain, range, inverse and composite relations), Matrix representation of a relations.

UNIT III

Percentage and Ratios' Applications: Percents, Commissions, Discounts, e.g., bill discounting, mark up and concepts of Ratios .Interest Applications: Simple interest, compound interest including half yearly and quarterly calculation, Installment Purchases (Cost of Installment, Effective rates, amortization of a loan.

UNIT IV

Stock and Share :Computation of the costs and proceeds of stock buy-and-sell; Computation of rates of yield and gains or losses on the purchase and sale of stocks; Computation of gains and losses on convertible and callable bonds, annual interest, accrued interest, and annual yield and computation of a rate of yield to maturity

Recommended books:-

S.No.	Author(S)	Title	Publisher
1	T R Jain, S C Aggarwal, N Ranade and S K Khurana	Business Mathematics and Statistics (Quantitative Techniques for Business)"	V K (India) Enterprises, NewDelhi
2	Dr. A. K Arte& R.V. Prabhakar	A textbook of Business Mathematics	
3	Sanchethi and Kapoor	Business Mathematics	

Course Code	MAT 110
Course Title	BUSINESS STATISTICS

Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	NA
Course Objectives (CO)	The aim to give an idea regarding the appropriate statistical tools used for the analysis of data.
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Inculcate an ability to identify & Solve all problems based on Probability. CO_3 Determine whether a regression model is significant.

Unit-I

Measures of Central Value:Introduction, Origin & Growth of Statistics, Definitions, Functions,Scopes and Limitations.Meaning of central value, Need for measuring central value.Characteristics of anideal measure of central value. Types of averages - mean, median, mode, harmonic mean andgeometric mean. Merits, Limitations and Suitability of averages.Relationship between averages.Measures of Dispersion: Meaning and Significance. Absolute and Relative measures of dispersion - Range, Quartile.Deviation, Mean Deviation, Standarddeviation moments,skewness,kurtosis.

Unit-II

Probability: Meaning and need. Theorems of addition and multiplication.Conditional probability.Bayes' theorem, Random Variable- discrete and continuous. Probability Distribution Meaning, characteristics (Expectation and variance) of Binomial, Poisson, Geometric, Uniform, Exponential and Normal distribution. Central limit theorem.

Unit-III

Correlation Analysis: Meaning and significance. Correlation and Causation.Types of correlation. Methods of studying simple correlation - Scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient, Regression Analysis: Meaning and significance. Regression vs. Correlation. Regression lines (X on Y, Y on X)

Unit-IV

Index Numbers: Meaning and significance. Problems in construction of index numbers Methods of constructing index numbers.

Recommended books:-

S.No.	Author(S)	Title	Publisher
1	S.P. Gupta	Statistical Methods	Sultan Chand & Sons
2	Richar Levin & David Rubin	Statistics for management	Prentice Hall

Course Code	MAT 521
Course Title	Quantitative Techniques
Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	Introduction toQuantitative Techniques
Course Objective (CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering. The goal is to provide a basic understanding of the concept of statistics analysis and use of these techniques along with a detailed understanding of Transforms in engineering applications
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Inculcate an ability to identify & Solve all problems based on Probability. CO_3 Determine whether a regression model is significant.

UNIT -I

Measures of Central Tendency : Arithmetic Mean; Calculation of mean in individual, discrete and continuous series, Properties of arithmetic mean, combined mean Median; Calculation of median in individual, discrete and continuous series Mode; Calculation of mode in individual, discrete and continuous series, Comparison of mean, median and mode. Measures of Dispersion: Range,Quartile deviation, coefficients of range and quartile deviation Mean Deviation; Calculation of mean deviation in individual, discreteand continuous series• Standard deviation; Calculation of standard deviation in individual,discrete and continuous series, Combined standard deviation,Variance. Coefficient of variation

UNIT – II

Correlation Analysis and Regression Analysis: Scatter Diagram, Karl Pearson's, Rank Correlation , Regression Equations-Deviation taken from Assumed mean and Arithmetic Mean, Least square method, Graphing Regression Lines. Index Number: Methods of Constructing index Number- Laspeyres, Paasche, Bowley's,Fisher and Marshall- Edgeworthmethod, Chain base Index Number. Analysis of Time Series: Method of Semi-average, Moving average, Simple average, Ratioto-trend method, Ratio-to-Moving average Method

UNIT-III

Progression Series: Arithmetic Progression; Definition nth term of anA.P, sum of n termsArithmetic mean, A.M. between two numbers Managerial application of A.P. series Geometric Progression; Definition, nth terms of G.P. series, sum of nterms Geometric mean between two numbers, managerial application of G.P.series. Matrices : Introduction to Matrix, Types of Matrix Difference of two matrix, Properties of addition of matrix, Product of two matrix Transpose of Matrix, Determinants of a matrix Cofactors, Minors of a Matrix Adjoint of a matrix, Inverse of a Matrix, Solutions of equations by Crammer rule,Rank of a matrix.

UNIT- IV

Probability- basic concepts and approaches, addition, multiplication and Bayes' theorem, probability distributions - meaning, types and applications, binomial, Poissonand Normal distributions.Statistical inference: Concept of sampling distribution, parameter and statistics, standard error.Theory of estimation: Point and interval estimation, construction and confidence limits for mean.Tests of significance-parametric v/s non-parametric tests, hypothesis testing, large

samples, small samples- chi-square test, z-test, t-test, binomial test, analysis of variance. Independence of Attributes, Goodness of Fit.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Fundamentals of Statistics	Gupta, S C	New Delhi: Himalaya Publishing House, 2001. Print
2	Statistical Methods	Gupta, S P	New Delhi: Sultan Chand, 1979. Print
3	Basic Statistics for Business and Economics	Kazmier, Leonard J.	New York: McGraw-Hill, 1979. Print
4	Statistics for Management	Levin, Richard I	Englewood Cliffs, N.J: Prentice-Hall, 1987. Print.
5	. Linear Programming and Decision Making	Narag, A S.	New Delhi: S. Chand, 1979. Print.
6	Business Statistics by Example.	Upper Saddle River, NJ	Prentice Hall, 1996. Print.

Course Code	**MAT523**
Course Title	Advanced Engineering Mathematics
Type of course	Core
L T P	4 0 0
Credits	4

Course prerequisite	+2 with non-medical
Course Objective (CO)	
Course Outcome (CO)	CO_1 Enable students in handling linear systems using matrices CO_2 Inculcate an ability to make circuits in Electrical & Electronics Engineering CO_3 Construct branches of inverse functions.

UNIT I

Fourier Transforms: Introduction, Fourier Integral Theorem, Fourier Sine and Cosine Integral, Complex form of Fourier Integrals, Fourier Transforms, Fourier Sine and Cosine Transform, Inverse Fourier Transform, Properties, Modulation Theorem, Convolution Theorem for FourierTransforms, Parseval's Identity, Fourier Transforms of derivative of functions, Relation between Fourier and Laplace transform.

UNIT II

Z –Transforms: Introduction, Representation of a Sequence, Properties of Z- Transforms, Some Standard Results of Z – Transforms, initial and Final value Theorem, Convolution Theorem, Z – Transforms by using Method of residue, Evaluation of inverse Z – Transforms by (Long Division Method, Partial Fraction Method and method of Residue).

UNIT III

Matrices And Linear System Of Equations: Solution of linear System of equations by Gauss elimination, Gauss Jordan and Crout'striangularization method, Iterative methods-Jacobi's method, Gauss-Seidal method, Determination of largest and Smallest Eigen values by Power method and Determination of Eigen values and Eigen vectors by Jacobi's method

UNIT IV

Conformal Mapping: Definitions and examples of Conformal mappings, rotation, magnification, inverse, bilinear transformation (mobius transformation), Cross-ratio, Physical interpretation of transformation like- w=z1/2, w = c coshz, w = sinz, w = z + 1/z, w = z2, Schwarz's Christoffel'sMapping.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers
2	Fourier Series and Boundary Values Problems	Churchill	McGraw Hill.
3	Complex Variables & Applications	Churchill	McGraw Hill.
4	Engineering Mathematics	Bali &lyingar	Laxmi Publication.
5	Advanced Engineering Mathematics	Wylie and Barren	Mcgrawhill,6thedition,1995
6	Advanced Engineering Mathematics	Kreyszig, John Wiley	
7	Engineering Mathematics-III,II	MunishSethi	Satya Prakashan, Delhi

8	Higher Engineering Mathematics	B V Ramana	Tata Mcgraw-Hill
9	Engineering Mathematics	Babu Ram	Pearson publication
10	Advanced Engineering Mathematics	R.K.Jain and S.R.K Iyengar Second Edition	Narosa publishing House

Course Code	**MAT 524-19**
Course Title	Research Methodology and IPR
Type of course	Core
L T P	5 0 0
Credits	5
Course prerequisite	Basic of Research Methodology

Course Objective (CO)	The course aims at equipping students with an understanding of the research process, tools and techniques in order to facilitate managerial decision making.
Course Outcome (CO)	CO_1 Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems CO_2 an ability to analyse the social impact of intellectual property law and policy CO_3 Enable to Work in teams, solve problems and manage time.

Unit –I

An Introduction to Research: Meaning, Definition, Objectives and Process; ResearchProblem: Selection Of Problem, Understanding Problem, Necessity Of Defined Problem; Review Of Literature In Research. Research Design: Meaning, Types –Descriptive, Diagnostic, Exploratory, And Experimental.

Unit –II

Sources Of Data: Primary And Secondary; Data Collection Methods; Questionnaire Designing: Construction, Types And Developing A Good Questionnaire. Sampling Design and Techniques, Scaling Techniques, Meaning, Types, Data Processing Operations, Editing, Coding, Classification, Tabulation. Research Proposal/Synopsis Writing.

Unit –III

Statistics - Descriptive Statistics: Central Tendency and Dispersion, Correlation: Linear, Partial and Multiple, Simple and Multiple Regression, Discriminant Analysis, Conjoint Analysis, Time Series and Business Forecasting. Applications of Index Numbers; Sampling Distribution; Tests Of Significance: Z-Test, T-Test, Chi-Square Test, F -Test, And ANOVA; Use Of SPSS For T-Test, Chi-Square Test and ANOVA.

Unit –IV

Multi Dimensional Scaling: Factor Analysis, Cluster Analysis, Interpretation of Data, Report Preparation and Presentation. Each Student has to prepare Mini Research Project on Topic / Area of their Choice and Make Presentation. The report should consist of application of tests and techniques mentioned in above units. Relevant Case Studies should be discussed in class.
Note:Practical-Use of SPSS / Systat and Excel.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Business Research Methods	D R. Cooper, &P.S,Schindler	Tata McGraw Hill
2	An Applied Orientation	N. Malhotra, and S.,Dash, Marketing Research	Pearson Education
3	Research Methodology: Methods & Techniques	C.R,Kothari	New Age International Publishers
4	SPSS Explained	Hiolton, Brownlow McMurray,Cozens	Tata McGraw Hill

5	Business Research Methods	Willian G.Zikmund	Thomson South-Western Learning
6	SPSS for Windows Step by Step	Darren George & Paul Mallery	Pearson Education
7	Marketing Research	Churchill & Israel	Cengage Learning
8	Marketing Research: Text & Cases	RajendraNargundka	Tata McGraw Hill
9	Business Research Methodology	Srivastava and Rego	Tata Mc Graw Hill
10	Essentials of Marketing Research	Zikmund	Cengage Learning

Course code	**MAT204**
Course Title	Introduction of Operational research
Type Of course	Core
LTP	4: 0: 0
Credits	4

Course Prerequisites	Basic understanding of Mathematics
Course objective	The students will be able to learn about the concept of linear programming, know about transportation problems
Course Outcome (CO)	CO_1 Formulate and solve problems as networks and graphs. CO_2 Inculcate An ability to reduce cost in various fields such as Assignment, game Theory. CO_3 Enable students to work in teams, solve problems and manage time.

UNIT-I

Introduction to operational research: features, models,limitation .Introduction to linear programming problem their problem formulations .Graphical solution of linear programming problems .Theory of simplex method. . , simplex method. Big- M method. Primal dual relationship, formulation of dual problems.Duality in linear programming, economic interpretation of duality.**Simulation**: introduction, meaning, features and limitation

UNIT-II

. **Concepts of PERT & CPM techniques and their applications**; Network analysis-scheduling activities, determining critical path, calculation of floats; Time-cost trade-off; Resource allocation and resource levelling.

UNIT-III

Assignment problem:Assignment problem and its mathematical formulation.Hungarian method for solving assignment problem. Transportation problem and its mathematical formulation, North Westcorner method, least cost method and Vogel approximation method for determination of starting basic solution.

UNIT-IV

Game theory: features, limitations of game theory, Two person zero sum game maxim in-minimax principle, games without saddle point. .

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Principles of Operations Research	HM Wagner	Prentice Hall

2	Operations Research	PK Gupta and DS Hira	., S. Chand & Co.
3	Introduction to Operation Research	Taha	
4	Introduction to Operation Research	F.S. Hiller and G.I. Libermann	Holden Ray
5	Operations Research	R Panneerselvan	

Course Code	**MAT528**
Course Title	MATHEMATICS FOR CHEMISTS
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	B.Sc. with Chemistry as one of the main Subjects or Equivalent

Semester	II
Course Outcome (CO)	
Course Outcome (CO)	CO_1 . Understand the rules of differentiation CO_2 Inculcate an ability to use Trigonometric fuctions in various contexts. CO_3 Enable to use integration to solve linear problems.

UNIT I

Trigonometry : Definition of sin, cos, tan, cot, sec, cosec functions with the help of unit circle, values ofsin x cos x cos x for x = 0, n/6, n/3, n/2. Meaning of a trigonometrical identity. TheSome identities and questions based on these identities (no need of derivation and proof. However, application has to beemphasized).

UNIT II

Determinants and Matrices: Definition and expansion properties of determinants, product of two determinants of 3rdorder.Introduction to various terms Matrix, row, column, diagonal unit. Sub, square, equal matrices, null, symmetricular, order of, character of, transpose of, adjoint of, inverse ofmatrices. Addition multiplication, Multiplication of matrices.

UNIT III

Differential Calculus : Differentiation of standard functions, theorems relating to the derivative of the sum,difference, product and quotient of functions, derivative of trigonometric functions,inverse trigonometric functions, logarithmic functions and exponential functions,differentiation of implicit functions, logarithmic differentiation.

UNIT IV

Integral Calculus : Integration as an inverse of differentiation summation, area under a curve, indefiniteintegrals of standard forms, method of substitution, method of partial fractions,integration by parts, definite integrals.

Recommended books:-

S. No	Name	Author(S)
1	Differential Calculus	Santi Narayan
2	Integral Calculus.	Santi Narayan
3	Higher Engineering Mathematics	B.S. Grewal
4	Mathematical Techniques in Chemistry	Joseph B. Dence
5	Mathematics of Physics and Chemistry	Margenau and Murphy
6	A Text Book of Engineering Mathematics	B.L. Moncha and H.R. Choudhary

Course Code	**MAT 206**
Course Title	Basics of Research Methodology
Type of course	Core
L T P	4: 0:0
Credits	4
Course prerequisite	Basic knowledge of research process
Course Objective (CO)	The course aims to make students understand the techanilities involved in a research work, various tools and techniques in order to facilitate managerial decision making.
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Inculcate an ability to identify & Solve all problems based on Research. CO_3 Determine whether a research model is significant.

Unit I:

Research Methodology: An Introduction to Research: Meaning, Definition, Objectives and Process of research, limitations and types. Importance of research in management decisions, defining research problemResearch Designs**:** Research design in case of different research studies.

Unit II:

Data collection: Types of data collection, methods used for collection of different data types, observation method and survey method. Various method and techniques of data collection

Unit III:

Measurement concept: Introduction to measurement and scales, levels of measurement-Nominal, ordinal, interval and ratio(explain briefly).Report writing**:** Writing and formatting of reports, graphical presentation

Unit IV:

Data presentation and analysis: Data preparation and preliminary analysis, Statistical analysis and interpretation of data .Multivariate analysis of data.Additional Statistical methods.
.

Recommended books:-

S. No	Name	Author(S)	Publisher
1.	Business Research Methods	D R. Cooper, &P.S,Schindler	Tata McGraw Hill
2.	An Applied Orientation	N. Malhotra, and S.,Dash, Marketing Research	Pearson Education

3.	Research Methodology: Methods & Techniques	C.R,Kothari	New Age International Publishers
4.	SPSS Explained	Hiolton, Brownlow McMurray,Cozens	1. Tata McGraw Hill
5.	Business Research Methods	Willian G.Zikmund	Thomson South-Western Learning
6.	SPSS for Windows Step by Step	Darren George & Paul Mallery	Pearson Education
7.	Marketing Research	Churchill & Israel	Cengage Learning
8.	Marketing Research: Text & Cases	RajendraNargundka	Tata McGraw Hill
9.	Business Research Methodology	Srivastava and Rego	Tata Mc Graw Hill
10.	Essentials of Marketing Research	Zikmund	Cengage LearningUICM

Course Code	**MAT611**
Course Title	**Operation research**
Type of Course	**Theory**
L T P	**5:0:0**
Credits	**5**
Course Prerequisites	Basic knowledge of mathematics
Course objective(CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering
Course Outcome (CO)	CO_1 Formulate and solve problems as networks and graphs. CO_2 Inculcate an ability to reduce cost in various fields such as Replacement Problem. CO_3 Enable to Work in teams, solve problems and manage time.

Unit -I

Operation Research: Concept and significance of operations research; Evolution of operation research; Steps in designing operations research studies; Operations research models, MethodologyLinear Programming and its Applications: Graphic method and simplex method. Duality problem.

Unit-II

Replacement problem : Introduction- Replacement of Equipment/Asset that deteriorates gradually-Replacement Policy when value of money does not change with time. Case 1: when t is acontinuous variable. Case 2: when t is a discrete variable- Replacement Policy whenvalue of money changes with time and its Corollary- Selection of the best equipmentamongst two-Replacement of equipment that fails suddenly- Reliability and SystemFailure Rates- Definition of Reliability- Failure Rates- Bath-tub-shaped Failure Rate-Instantaneous Failure Rate- Mean Time Between Failure (MTBF)- Estimation ofReliability-Reliability Improvement.

UNIT-III

Inventory and Queuing Management: Concepts of inventory management; Inventory models –classical EOQ, EOQ with price breaks, EOQ model for production runs, planned shortage model-deciding optimum safety stock and reorder level, probabilistic model; Techniques of selective control.Queuing models: Elements of a queuing system; Models with Poisson arrival and Exponential services rates-single server and infinite and finite population; Cost behavior analysis.

Unit--IV

Project Scheduling: Concepts of PERT & CPM techniques and their applications; Network analysis-scheduling activities, determining critical path, calculation of floats; Time-cost trade-off; Resource allocation and resource levelling. Introduction to Other Types of Programming: Goal programming; Integer programming; Dynamic programming Non-linear programming (introductory only)

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Principles of Operations Research	HM Wagner	Prentice Hall
2	Operations Research	PK Gupta and DS Hira	., S. Chand & Co.
3	Introduction to Operation Research	Taha	
4	Introduction to Operation Research	F.S. Hiller and G.I. Libermann	Holden Ray
5	Operations Research	R Panneerselvan	

Course code	MAT609
Course Title	Mathematical Foundation of computer science
Type Of course	Core
LTP	420
Credits	5
Course Prerequisites	Basic understanding of mathematics
Course objective	The students will be better learn the concepts of graph theory, set theory, they able to know about logics and matrices algebra.
Course Outcome (CO)	CO_1 Demonstrate the ability to write and evaluate a proof in Logics. CO_2 Students can write an argument using logical notation and determine if the argument is or is not valid. CO_3 Students become capable to use Graphs in Networking & other engineering problems.

UNIT-I

Graphs: A general introduction, simple and multi graphs , directed and undirected graphs, Eulerian and Hamiltonian graphs ,shortest path algorithms, chromatic number ,bipartite graph, graph coloring

UNIT-II

Sets and Relations :Definiton of sets, subsets ,compliment of sets, universal sets, intersection and union of sets, De-Morgan's law ,Cartesian products, Equivalents sets, countable and uncountable sets, min-set, partition of sets. Relation: Basic definitions, graphs of relations , properties of relations.

UNIT-III

Algebra of logic, Proposition, Connectives, Tautologies, Contradiction, equivalence and implication, principle of Mathematical induction, quantifiers

UNIT-IV

Matrices: Introduction of a Matrix ,its different kinds, matrix addition and scalar multiplication, multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix, solving simultaneous equation using Gauss elimination, Gauss Jordan method, Matrix inversion method

Recommended Books			
S no	**Name**	**Authors**	**Publisher**
1	Discrete Mathematical structures for computer Sciences	Publications. Kolman and Busby	PHI
2	Discrete Mathematical Structures for computer Sciences	B Kolman and R.C	MeGraw-Hill
3	Discrete Mathmatics	Dr.P.K Sharma	Sharma publisher

Course Code	**MAT 212**
Course Title	**Discrete Structures**
Type of course	PC
L T P	3 1 0
Credits	4
Course prerequisite	Basic Mathematics
Course Objective (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students: (1) To understand the theory knowledge as well as practical knowledge of different formulas. (2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures.
Course Outcome (CO)	CO_1 Demonstrate the ability to write and evaluate a proof in Logics. CO_2 Students can write an argument using logical notation and determine if the argument is or is not valid. CO_3 Students become capable to use Probability in engineering problems.

UNIT I:Graph theory: Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles, Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications

UNIT II: Sets and functions: Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, and partial order relations.

Monoids and groups: Groups Semigroups and monoids Cyclic semigraphs and submonoids, Subgroups and Cosets, Congruence relations on semigroups, Morphisms. Normal subgroups, Structure of cyclic groups.

UNIT III: Boolean algebra: Boolean algebra, direct product, morphisms Boolean, sub-algebra Boolean Rings Application of Boolean algebra (Logic Implications, Logic Gates, Karnaughmap).

UNIT IV: Probability: Sample spaces, events and probability functions, Examples using counting methods, sampling with and without replacement, Algebra of events, Conditional probability, partitions of sample space theorem of total probability. Baye's theorem, independence, Random variables, Probability mass functions. Discrete distributions, Bernoulli binomial, Poison, geometric Expectation mean and variance independence for discrete random variables.

Text & Reference books:-

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Discrete Mathematics	Schaum series by Lipschutz	McGraw Hill
2	Applied Discrete Structures for Computer Science	Alan Doerr and Kenneth Levarseur.	Science Research Associates

3	Discrete Mathematics	N Ch SN Iyengar, VM Chandrasekaran.	Vikas Publishing
4	Discrete Mathematics and Graph Theory	by Sartha	Cengage Learning
5	Discrete Mathematics and its Applications.	Kenneth H Rosen	McGraw Hill

Course Code	MAT205
Course Title	Applied Mathematics -III
Type of course	Theory
L T P	3 2 0
Credits	4
Course prerequisite	+2 Mathematics, Engg. Maths-1, Engg. Maths-2
Course Objective (CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis and use of these techniques along with a detailed understanding ofTransforms in engineering applications.
Course Outcome (CO)	CO_1 Enable students to use Fourier Series & Laplace Transform to make Circuits in Electrical & Electronics Engineering. CO_2 Check the condition for a complex variable function to be analytic and/or harmonic & find complex conjugates CO_3 Enable students to use **Laplace transform** techniques to solve second-order ordinary differential equations i.

Syllabus

UNIT-I

Partial Differential Equations- First order: First order partial differential equations, solutions of first order linear and non-linear PDEs..

Partial Differential Equations– **Higher order :** Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Separation of variables method to simple problems in Cartesian coordinates.

UNIT II

Laplace Transforms: Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

UNIT III

. **Sequences and series:**. Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV

Probability Theory : Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the

binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Higher Engineering Mathematics (Third Edition) Vol-II	By Dr. K.R. Kachot	Mahajan Pub. House, Ahmedabad
2	Advanced Engineering Mathematics (Fifth Edition)	Erwin Kreyszig	John Wiley – 1999
3	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna, New Delhi.
4	Elementry Differential Equations	W.E.Boyce and R.Diprima	John Wiley – 2005
5	Fourier Series& Boundary Value Problems	R.V. Churchill & J.W. Brown	McGraw-Hill – 2006

Course Code	**MAT304**		
Course Title	NUMERICAL AND STATISTICAL METHODS		
Type of course	Theory		
L T P	40 0		
Credits	4		
Course prerequisite	NIL		
Course Objective (CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering.		
Course Outcome (CO)	CO_1 Enable students to derive **numerical methods** for various mathematical operations and tasks, such as interpolation, differentiation, integration. CO_2 Enable students to analyse and evaluate the accuracy of common **numerical methods**. CO_3 Enable students to use Ordinary differential equations in various context.		

Syllabus

UNIT I

Numerical differentiation and integration: Newton's forward and backward differences formulae to compute first and higher order derivatives, The Trapezoidal rule, Simpson's one third rule and three eighth rule.

UNIT II

Solution of Non-linear equations: Bisection method for solution of a single non-linear equation and its rate of convergence. Ragulafalsi method for solution of a single non-linear equation and its rate of convergence. Newton-Raphson method for solution of a single non-linear equation. Rate of convergence.Solution of system of linear equation:Gauss elimination method with concept of partial and complete pivoting. Gauss Jordan method for solving linear equations. Jacobi's method and Gauss Siedel method for solving system oflinear equations

UNIT III

Finite differences and Interpolation: First and Higher order differences, Forward differences and backward differences, Properties of operators, Shifting operator E, Relations between the operators. Newton Forward and Backward Interpolation formulae, Divided differences, Newton's Divided difference formula, Lagrange's Interpolation formula, Inverse interpolation.

UNIT IV

Numerical solution of ordinary differential equations Solution by Taylor's series, Euler's method, modified Euler method, Runge-Kutta methods upto fourth order (No proof), Milne's Method, Adam's Bashforth method.

S. No	Name	Author(S)	Publisher
1	Numerical Methods,	Dr. B.S. Grewal	Khanna Publishers
2	Introductory Methos of Numerical Analysis	S.S. Shastri	PHI
3	Numerical Methods	M.K. Jain, SRK Iyengar, R. K.Jain	New Age Intl. Publishers
4	Numerical Solution of Differential Equations	M.K.Jain,	

Course Code	**MAT401**
Course Title	OPTIMIZATION TECHNIQUES
Type of course	Theory
L T P	3 2 0
Credits	4
Course prerequisite	NIL
Course Objective (CO)	This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering.
Course Outcome (CO)	CO_1 Formulate and solve problems as networks and graphs. CO_2 Inculcate an ability to reduce cost in various fields ,such as Real life & Industrial , Transportation and assignment Problem. CO_3 Enable students to Work in teams, solve problems and manage time.

Syllabus

UNIT -I

Mathematical Models :-Graphical And Simplex Techniques For Solution Of Linear Programming Problems, Big M Method And Two Phase Method, Introduction To DualityTheory And Sensitivity Analysis Transportation, Assignment And Sequencing Model.

UNIT-II

Introduction: Applications Of Simulation, Advantages And Limitations Of simulation.Game theory :- Solution Of Simple Two Person Zero-Sum Games :Examples Of Simple Competitive Situation. Non-Linear Programming:-Characteristics,Concepts of convexity, Maxima and Minima of functions of n variables using Langrange multipliers and Kuhn Tukkar conditions, Quadratic Programming, One dimensional search methods

UNIT-III

Replacement Models :-Replacement Of Items That Deteriorate, Replacement Of Items Whose Maintenance And Repair Costs Increase With Time, Replacement Of Items That Fail Suddenly; Replacement Of Items Whose Maintenance Costs Increase With Time And Value Of Money Also Changes, Individual Replacement Policy, Group Replacement Policy. Classification of inventory control models : Inventory models with deterministic demand, inventory models with price breaks.

UNIT-IV

Network models : Shortest route and traveling sales - man problems, PERT & CPM introduction, analysis of time bound project situations, construction of networks, identification of critical path, slack and float, crashing of network for cost reduction, resource leveling and smoothening.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	. Principles of Operations Research	HM Wagner	Prentice Hall.
2	Operations Research	PK Gupta and DS Hira	S. Chand & Co.
3	Introduction to Operation Research	Taha	

4	Introduction to Operation Research	F.S. Hiller and G.I. Libermann	Holden Ray
5	Operations Research	R Panneerselvan	
6	Optimization Techniques	C.B.Gupta	

Course Code	**MAT 203**
Course Title	**Mathematical techniques in computer science**
Type of Course	**Theory**
L T P	**5:0:0**
Credits	**5**
Course Prerequisites	Basic knowledge of mathematics
Course objective(CO)	This course will provide students with knowledge of numbers set theory, mathematical logic, matrices and determinants geometry and relations
Course Outcome (CO)	CO_1 Students demonstrate the ability to write and evaluate a proof in Logics. CO_2 Students can write an argument using logical notation and determine if the argument is or is not valid. CO_3 Students become capable to use Graphs in Networking & other engineering problems.

SYLLABUS

UNIT I

Set Theory: Definition and types of sets. Equal sets, subsets, universal sets, Venn diagram. Set operations. Properties of set union and intersections. (with Venn diagrammatic proofsonly)

UNIT II

Mathematical Logic: Propositions. Logical connectives and compound statements Truth values and truth table. Statement pattern and logical equivalence. Tautology, contradiction, contingency. Validity of arguments. Predicates

UNIT III

Matrices and Determinants: Definition and types of matrices. Equality of Matrices and transpose of matrices. Algebra of matrices: addition, subtraction of matrices, scalar, Multiplication of matrix andDefinition of Determinant, Adjoint of matrices, Inverse of matrices

UNIT IV

Graph Theory: Definition and types of graphs. Incidences and degree of vertices Isomorphism of graphs. Connected and disconnected graphs. Walks, paths and circuits. Directed Graph. Trees, Binary Tree. Elementary results (Properties or Theorems) of graphs, connected Graphs and Trees (Without proof)

RECOMMENDED BOOKS

s. no	Name	Author	Publisher
1	Elements of discrete mathematics	C.L .LIU	Mcgraw-Hill
2	. Discrete Mathematics	Olympia Nicodemi	West publishing company

Course Code	**MAT215**
Course Title	Statistical Method
Type of course	Theory
L T P	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course Objective (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems
Course Outcome (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on Statistics CO_2 Inculcate an ability to identify & Solve all problems based on Probability. CO_3 Inculcate an ability to use graphical representation of data to depict various results by using various formulae of Statistics.

UNIT-I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion.

UNIT-II

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation.

UNIT-III

Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 × 2 Contingency Table.

UNIT-IV

Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

1. Graphical Representation of Data. 2. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. 3. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. 4. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). 5. Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). 6. Correlation & Regression Analysis. 7. Application of One Sample t-test. Application of Two Sample Fisher's t-test. 8. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 ×2 contingency table. 9. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Statistical Method for Research workers	Singh, S, Singh, T.P Babsal, M.L and Kumar R	Kalyani Publishers, Ludhiana
2	Statistical methods for agricultural workers,	Panse, V.G., Shaw, F.J., and Sukhatme, P.V.	Indian Council of Agricultural Research,

Course Code	**MAT529-18**
Course Title	**Experimental designs**
Type of Course	Theory
L T P	2 0 0
Credits	2(2 +0)
Course Prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems.
Course Outcomes (CO)	CO_1 Inculcate an ability to identify & Solve all problems based on experiment designs . CO_2 Inculcate an ability to identify & Solve all problems based on Factorial Experiments. CO_3 Inculcate an ability to use randomization procedure and interpretation of results of Various problems.

Syllabus

UNIT-I: Need for designing of experiments, characteristics of a good design, basic principles of designs - randomization, replication and local control. Uniformity trials, analysis of variance and interpretation of data, transformations, orthogonality and partitioning of degrees of freedom.

UNIT-II: Completely randomized design, randomized block design and Latin square design, repeated Latin square design, analysis of covariance and missing plot techniques in randomized block and Latin square designs.

UNIT-III : Factorial experiments (symmetrical as well as asymmetrical), confounding in symmetrical factorial experiments, factorial experiments with control treatment.

UNIT-IV: Split plot and strip plot designs, crossover designs, balanced incomplete block design, lattice design-concepts, randomization procedure, analysis and interpretation of results, experiments with mixtures.

Practical:

1. Analysis of data obtained from CRD, RBD, LSD
2. Analysis of factorial experiments with and without confounding
3. Analysis with missing data; balanced incomplete block design; split plot and strip plot designs; transformation of data
4. Analysis of lattice design.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Statistical Method for Research workers	Singh, S, Singh, T.P Babsal, M.L and Kumar R	Kalyani Publishers, Ludhiana

2	Statistical methods for agricultural workers,	Panse, V.G., Shaw, F.J., and Sukhatme, P.V.	Indian Council of Agricultural Research,

Theory

Course Code	**MAT107**
Course Title	**Elementary Mathematics**
Type of course	Theory
L T P	2 0 0
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to introduce medical students about the fundamentals of mathematics being used in agriculture sciences.
Course outcomes	CO1 Students will able to understand about fundamentals of mathematics being used in agriculture sciences
	CO2 Students will learn about differential calculus : definition of function, limit and continuity, simple problems on limit, simple problems on continuity
	CO3 Students will learn about integral calculus : integration of simple functions, integration of product of two functions, integration by substitution method,

UNIT-I

Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two straight lines.

UNIT-II

Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x1, y1) & (x2,y2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x2 + y2 = a2$.

UNIT-III

Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple
problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it).

UNIT-IV

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it). Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation**.**

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Mathematics for Agriculture	D. G. Mackean	John Murray
2	Mathematics for students of agriculture	Rasor, Samuel Eugene	Macmillan, New York.

Course Code	**MAT515-19**
Course Title	**BIOSTATISTICAL METHODS**
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	B. Sc. Medical
Course Objective	To aware students about the use and significance of statistical techniques in biological science.

BIOSTATISTICAL METHODS

UNIT I

Data collection, tabulation, Frequency distribution and its graphical representation Measures of Central tendency: mean, mode, median Measures of Dispersion: range, variance, Standard deviation and Standard error

UNIT I

Mathematical definition of a probability event Conditional probability
Additive and Multiple law of Probability Theoretical Distributions: Binomial, Poisson and Normal

UNIT III

Null Hypothesis and Level of Significance Confidence limit and confidence intervalSkewness and Kurtosis moments. Student's t- test (Paired and Unpaired) Chi Square test

UNIT IV

Correlation: Covariance, Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient Regression: Least square technique for regression lines, regression coefficient Relation between Correlation and Regression Analysis of variance (one way and two way ANOVA

Text and Reference books:

S.No.	Name/Title	Author	Publisher
1	Introduction to Mathematics for Life Scientists	Batschelet, E	Springer-Verlag, Berlin
2	Mathematical Biology	Murray, J.D.	Springer-Verlag, Berlin
3	Statistical Methods	Snedecor& Cochran	Affliated East-West Press
4	Biostatistics	P. Ramakrishnan	Saras Publications
5	Biostatistics: Basic Concepts and Methodology for the Health Sciences	Wayne W. Daniel	Wiley Publication

Course Code	**CHM105**
Course Title	Engineering Chemistry
Type of course	BS
L T P	3 0 0
Credits	3
Course prerequisite	NA
Course Objective (CO)	The objectives of the engineering chemistry are to relate the students with basic concepts of chemistry. Some new topics have been introduced to the syllabus for the development of the right attitudes by the engineering students to cope with new technology
Course Outcomes (CO)	CO_1 Students Acquired knowledge of the basic chemistry, to understand and explain scientifically the various chemistry related problems in engineering field. CO_2 Inculcate an ability to identify & Solve all problems based on different chemical reactions CO_3 Enable to understand new developments in chemistry.

SYLLABUS

UNIT-I

Water and its Treatment: Boiler feed water: Specification, Scales and sludge formation; Priming & foaming; Different methods of the water purifications and softening; Water for domestic use; Specifications; Disinfection of water.

Corrosion and its Prevention: Introduction; Different types of corrosion ;Wet and Dry corrosion; Mechanisms of wet & Dry corrosion;Concentration cell corrosion and differential aeration corrosion; Soil and microbial corrosions; waterline, stress corrosions; Prevention measure against corrosion.

UNIT-II

Spectroscopy and its Applications: An introduction 1). UV/Visible Spectroscopy: Selection rules; Line widths and intensities Chromophores &auxochromes; Principle and instrumentation; Electronic Transitions lines; Franck Condon principle; Applications of UV/Visible spectroscopy.

2).I.R. spectroscopy: Fundamental modes of vibrations and types; Factors affecting vibration frequency; Applications of I.R. spectroscopy.

3). NMR Spectroscopy: Principle & instrumentation; Chemical shift; Spin-Spin Splitting; applications of N.M.R. spectroscopy.

Photochemistry: Introduction; Photophysical& photochemical processes; Light sources in photochemistry; Beer Lambert Law; Laws of Photochemistry; Quantum yield (primary and overall); Primary and secondary photochemical reactions; Jablonski diagram; Semiconductor photochemistry, Photovoltaic cells Introduction to optical sensors.

UNIT-III

Green Chemistry and its Applications: Introductory overview Definition and concepts of Green chemistry; Twelve principles of Green Chemistry with emphasis on the use of alternative feedstock (biofuels); Design of the safer chemicals; Microwave and ultrasonic radiation in Green synthesis minimizing energy consumption.

Polymers and Reinforced Composites: Introduction; Functionality; Types of polymerization; Specific features of polymers; Tactility of polymers; Average molecular weights and size; polymers; Introduction: polymer reinforced composite; Effect of molecular weight on the properties of polymers; Biodegradable polymers.

UNIT-IV

Nanochemistry: Introduction; Materials self-assembly; Molecular vs. materials self assembly; Self-assembling materials; Two dimensional assemblies; Mesoscale self assembly; Coercing colloids; Nanocrystals; Super molecular structures Nanoscale materials; Future perspectives.

Petrochemicals: Introduction; First, second & third generation petrochemicals; Primary Raw Materials for Petrochemicals, Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas; Crude oil: Composition of crude oil-Hydrocarbon compounds; Non-hydrocarbon compounds; Metallic Compounds, Crude oil classification Physical separation processes; Conversion processes; Renewable and non renewable source of energy.

RECOMMENDED BOOKS

S. No	Name	Author(S)	Publisher
1.	Engineering chemistry	J.C. Curiacose and J.Raja Ram	Tata Mcgraw-Hill Co. New Delhi.
2.	Chemical applications of infrared spectroscopy	CNR. Rao.	Academic Pres, New York.
3.	Ultra violet and visible spectroscopy chemical applications	CNR, Rao	Plenum press

Course Code	PHY105
Course Title	Applied Physics
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	NA
Course Objective (CO)	To educate students to become professionals with in-depth knowledge and skills in engineering to understand physical systems; to research, design, and solve problems; and to provide the foundation for graduate study and lifelong learning.
Course Outcomes (CO)	CO_1 To develop the understanding of laws of thermodynamics and their application in various processes. CO_2 To formulate and solve the **engineering** problems on Electromagnetism. CO_3 To aware of limits of classical **physics** & to apply the ideas in solving the problems in their parent streams.

SYLLABUS

UNIT-I. Electromagnetics: Physical significance of Gradient, Divergence & Curl, Differential approach to Gauss Law, Ampere's law and Faraday's law, Stoke'stheorm, Gauss divergence theorem, Equation of continuity, Maxwell's Equations, Dielectric polarization, displacement Current.

Physics of Materials: Basic ideas of Dia, Para, Ferro &Ferri, Ferrites,Domaintheory,Magnetic Anisotropy, Magnetostriction, B-H curve, Hard and Soft magnetic materials, Superconductivity, Superconductors as ideal diamagnetic materials, Meissner Effect,Type I & Type II superconductors, London Equations, Introduction to BCS theory.

UNIT-II. Special Theory of Relativity: Concept of Ether, Michelson Morley experiment, Einstien's postulates, Lorentz transformation equations, lengh, time and simultaneity in relativity, Addition of velocity, Variation of mass with velocity,Energy momentum relations.

UNIT-III Lasers: Introduction, Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Lasing action, properties of laser,Ruby, He-Ne, CO_2 and semiconductor Lasers, Characteristics of different types of lasers, Applications of lasers, Holography.
Fibre Optics: Introduction, Acceptance Angle, Numerical Aperture, Normalized Frequency, Modes of propagation, Losses in Optical Fibre, Applications of Optical Fibres.

UNIT-IV. Physics of crystallography: Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes & Directions in cubic system, Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in Crystals,

Nanophysics: Nanoscale, Nanoparticles(1D 2D 3D), Nanomaterials and their properties, Synthesis Methods- Ball milling and sol- gel techniques, Carbon nanotubes (Synthesis and properties), Applications of nanomaterials.

Recommended books:-

S. No	Name	Author(S)	Publisher
1	Physics for Scientists & Engineers (Vol. I &II),	Serway& Jewett, 6thEdition	Cengage Learning.
2	Engineering Physics,	Malik; HK, Singh; AK,	Tata McGraw Hill
3	Materials Science &Engg.,	Raghvan V.	Prentice Hall of India
4	Concepts of Modern Physics	Beiser; A., Mahajan; S., Choudhary; SR	Tata McGraw Hill
5	Solid State Physics	Dan Wei,	Cengage Learning
6	Introduction to Solids	Azaroff LV	Tata Mc Graw Hill
7	Introduction to Electrodynamics	Griffiths; DJ,	Prentice Hall
8	Lasers & Optical engineering	Dass; P,	Narosa Publishers
9	Optical Fibre system, Technology, Design & Applications	Kao; CK	McGraw Hill.