SEMESTER-II

2.2 Differential Equations

DSC-1B

BS:201

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.
Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit- I

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y)- Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation.
Applications of First Order Differential Equations : Growth and Decay - Dynamics of Tumour Growth - Radioactivity and Carbon Dating - Compound Interest - Orthogonal Trajectories
.

Unit- III

Higher order Linear Differential Equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = bc^{ax}, b\sin ax/b\cos ax, bx^k, Vc^{ax}$ - Method of undetermined coefficients.

Unit- IV

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations.
Partial Differential Equations: Formation and solution- Equations easily integrable - Linear equations of first order.

Text:

- Zafar Ahsan, *Differential Equations and Their Applications*

References:

- Frank Ayres Jr, *Theory and Problems of Differential Equations.*

Kakatiya University
B.Sc. Mathematics, VI Semester
VECTOR CALCULUS

DSE-1F/B
BS:606

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours/week and Practicals: 2 hours/week

Objective: Concepts like gradient, divergence, curl and their physical relevance will be taught.

Outcome: Students realize the way vector calculus is used to addresses some of the problems of physics.

UNIT- I

Line Integrals: Introductory Example : Work done against a Force-Evaluation of Line IntegralsConservative Vector Fields

UNIT- II

Surface Integrals: Introductory Example : Flow Through a PipeEvaluation of Surface Integrals. Volume Integrals: Evaluation of Volume integrals

UNIT- III

Gradient, Divergence and Curl: Partial differentiation and Taylor series in more than one variable-Gradient of a scalar field-Gradients, conservative fields and potentials-Physical applications of the gradient.

UNIT- IV

Divergence of a vector field -Physical interpretation of divergence-Laplacian of a scalar field- Curl of a vector field-Physical interpretation of curl-Relation between curl and rotation-Curl and conservative vector fields.

TEXT: P.C. Matthews, *Vector Calculus*
References:

- G.B. Thomas and R.L. Finney,*Calculus*
- H. Anton, I. Bivens and S. Davis : *Calculus*
- Smith and Minton,*Calculus*

Kakatiya University
B.Sc. Mathematics, V Semester
LINEAR ALGEBRA

)SC-1E
8S:503

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours/week and Practicals: 2 hours/week

Objective: The students are exposed to various concepts like vector spaces, bases, dimension, Eigen values etc.

Outcome: After completion this course students appreciate its interdisciplinary nature.

UNIT-I

Vector Spaces : Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transformations -Linearly Independent Sets; Bases -Coordinate Systems

UNIT-II

The Dimension of a Vector Space, Rank-Change of Basis - Eigenvalues and Eigenvectors .

UNIT-III

The Characteristic Equations, Diagonalization -Eigenvectors and Linear Transformations -Complex Eigenvalues - Applications to Differential Equations .

UNIT-IV

Orthogonality and Least Squares : Inner Product, Length, and Orthogonality -Orthogonal Sets

TEXT: David C Lay,*Linear Algebra and its Applications 4e*
References:

- S Lang, *Introduction to Linear Algebra*
- Gilbert Strang ,*Linear Algebra and its Applications*
- Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence: *Linear Algebra*
- Kuldeep Singh: *Linear Algebra*
- Sheldon Axler: *Linear Algebra Done Right*

2.2 Differential Equations

DSC-1B **BS:201**

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Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

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Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y)- Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation.
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Unit- IV

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations.
Partial Differential Equations: Formation and solution- Equations easily integrable - Linear equations of first order.

Text:

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References:

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Kakatiya University
B.Sc. Mathematics, VI Semester
VECTOR CALCULUS

DSE-1F/B
BS:606

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Theory: 3 hours/week and Practicals: 2 hours/week

Objectives: Concepts like gradient, divergence, curl and their physical relevance will be tau

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Line Integrals: Introductory Example : Work done against a Force-Evaluation of Line Integ servative Vector Fields

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References:

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- Smith and Minton, *Calculus*

Kakatiya University
B.Sc. Mathematics, V Semester
LINEAR ALGEBRA

DSC-1E
BS:503

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours/week and Practicals: 2 hours/week

Objective: The students are exposed to various concepts like vector spaces, bases, dimension, E values etc.

Outcome: After completion this course students appreciate its interdisciplinary nature.

UNIT-I

Vector Spaces : Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transfo tions -Linearly Independent Sets; Bases -Coordinate Systems

UNIT-II

The Dimension of a Vector Space, Rank-Change of Basis - Eigenvalues and Eigenvectors .

UNIT-III

The Characteristic Equation, Diagonalization -Eigenvectors and Linear Transformations -Comp Eigenvalues - Applications to Differential Equations .

UNIT-IV

Orthogonality and Least Squares : Inner Product, Length, and Orthogonality -Orthogonal Sets.

TEXT: David C Lay.*Linear Algebra and its Applications 4e*
References:

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- Kuldeep Singh: *Linear Algebra*
- Sheldon Axler:*Linear Algebra Done Right*

2017-18

DSC- 1C

REAL ANALYSIS

BS: 304

Theory: 4 credits and Practical 1 credit
Theory: 4 hours/week and Practicals - 2 hours/ week

Objective : The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

Unit- I

Sequences- Limits of sequences- A Discussion about Proofs- Limit Theorems for Sequences – Monotone Sequences and Cauchy Sequences

Unit- II

Subsequences- Lim sup's and Lim inf's Series- Alternating Series and Integrals Tests.
Continuity : Continuous functions- Properties of Continuous functions.

Unit – III

Sequence and Series of Functions: Power Series- Uniform Convergence – More on Uniform Convergence- Differentiation and Integration of Power Series (Theorems in this section without Proofs)

Unit – IV

Integration : The Riemann Integral- Properties of Riemann Integral- Fundamental Theorem of Calculus.

Text : Kenneth A Ross, Elementary Analysis- The Theory of Calculus

References :

2016-17
2019-20

SEMESTER-VI

(A) Numerical Analysis

(w.e.f. academic year 2019-20 batch onwards)

DSE-VI

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective. Students will be made to undofirstand some methods of numerical analysis.
Outcome. Students realize the importance of the subject in solving some problems of algebra and calculus.

Unit- I

Errors in Numerical Calculations - Solutions of Equations in One Variable: The Bisection Method - The Iteration Method - The Method of False Position-Newton's Method - Muller's Method - solution of Systems of Nonlinear Equations.

Unit- II

Interpolation and Polynomial Approximation: Interpolation - Finite Differences - Differences of Polynomials - Newton's formula for Interpolation - Gauss's central differences formulae - Stirling's and Bessel's formula - Lagrange's Interpolation Polynomial - Divided differences - Newton's General Interpolation formula - Inverse Interpolation.

Unit- III

Curve Fitting: Least Square Curve Fitting: Fitting a Straight Line-Nonlinear Curve Fitting. **Numerical Differentiation and Integration:** Numerical Differentiation - Numerical Integration: Trapezoidal Rule-Simpson's 1/3rd-Rule and Simpson's 3/8th-Rule - Boole's and Weddle's Rule - Newton's Cotes Integration Formulae.

Unit- IV

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Picard's Method - Euler's Methods - Runge Kutta Methods.

Text:

S.S Sastry,Introductory Methods of Numerical Analysis, PHI

References:

1] Richard L. Burden and J. Douglas Faires,Numerical Analysis (9e)

2] M K Jain, S R K Iyengar and R K Jain, Numerical Methods for Scientific and Engineering computation

3] B Bradie , A Friendly Introduction to Numerical Analysis