**SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY**

AUTONOMOUS

Accredited by National Board of Accreditation, AICTE, New Delhi

Accredited by NAAC with “A” Grade-3.32/4.00 CGPA,

Recognised under 2(f)&2(B) of UGC Act 1956,Approved by AICTE,

Permanently Affiliated to JNTUK, Kakinada

SEETHARAMPURAM, NARSAPURAM-534 280, W.G.DT.,

**B. Tech II SEMESTER**

**VECTOR CALCULUS & NUMERICAL METHODS**

**(FOR ECE)**

**SYLLABUS (R19)**

**Course Objectives:**

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**Unit- I: Ordinary Differential equations**

Linear differential equations – Bernoulli’s equations

Solutions of Non-homogeneous Linear differential equations of higher order with constant coefficients – with non-homogeneous term of the type e*ax*, sin ax, cos ax, polynomials in xn, e*ax* V(x) and xnV(x) – Method of Variation of parameters.

**Learning Outcomes:**

At the end of this unit, the student will be able to

* identify the essential characteristics of linear differential equations with constant coefficients (K3)
* solve the linear differential equations with constant coefficients by appropriate method (K3)

**Unit –II: Partial Differential Equations of First Order**:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

**Learning Outcomes:**

At the end of this unit, the student will be able to

* apply a range of techniques to find solutions of standard PDEs (K3)
* outline the  basic properties of standard PDEs  (K2)

**UNIT III: Vector Differentiation**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

**Learning Outcomes:**

At the end of this unit, the student will be able to

* apply del to Scalar and vector point functions (K3)
* illustrate the physical interpretation of Gradient, Divergence and Curl (K3)

**UNIT IV: Vector Integration**

Line integral-circulation-work done, surface integral-flux, Green’s theorem in the plane (without proof), Stoke’s theorem (without proof), volume integral, Divergence theorem (without proof).

**Learning Outcomes:**

At the end of this unit, the student will be able to

* find the work done in moving a particle along the path over a force field (K3)
* evaluate  the rates of fluid flow along and across curves (K3)
* apply Green’s, Stokes and Divergence theorem in evaluation of double and triple integrals (K3)

**Unit V: Numerical Methods for Algebraic Equations and Ordinary Differential Equations**

**Numerical Solution to algebraic equations:** Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method

**Numerical Solution of Ordinary differential equations:**Taylor’s series, Euler and modified Euler’s methods. Runge-Kutta method of fourth order for solving first order equations.

**Learning Outcomes:**

After completion of this unit student able to

* find approximate roots of the an equation by using different numerical methods (K3)
* solve ordinary differential equations by using different numerical schemes  (K3)

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna publishers, 2012.

**References:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

**Course Outcomes:**

At the end of the course, the student will be able to

1. solve the  differential equations and partial differential equations related to various engineering fields (K3)
2. interpret the physical meaning of scalar and vector point functions and different operators such as del, gradient, curl and divergence (K3)
3. estimate the work done against a field, circulation and flux using vector calculus (K3)
4. evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Student can solve ordinary differential equations by various numerical techniques.(K3)